Appendix D

Technical Memorandum: Results of High-Vacuum Dual-Phase Extraction Pilot Test Performed on the Perched Groundwater Zone and the Exposition 'A' and 'B' Groundwater Zones, December 2002

FINAL TECHNICAL MEMORANDUM

Date: March 2002

Prepared For: Rose Marie Caraway
USEPA Region IX

Prepared By: T N & Associates
Jacques Marcillac, Project Geologist
Tim Garvey, Project Manager

Re: Results of High-Vacuum Dual-Phase Extraction Pilot Test Performed on the Perched Groundwater Zone and Exposition 'A' and 'B' Groundwater Zones, December 2002
Pemaco Superfund Site
5050 East Slauson Avenue, Maywood, California.

Cc: John Hartley, United States Army Corps of Engineers

INTRODUCTION

T N & Associates, Inc. (TN&A) has prepared this technical memorandum to document field activities and results associated with the high-vacuum dual-phase extraction (HVDPE) pilot tests performed at the Pemaco Superfund site in Maywood, CA. The tests are considered "remedy-selection tests" per USEPA guidelines for performing treatability studies under CERCLA, as HVDPE could potentially enhance contaminant recovery from soil and groundwater at the site (USEPA, 1992). This work was accomplished under contracts issued to TN&A by the U.S. Army Corps of Engineers, Omaha District. All work was performed in accordance with the *HVDPE Draft Work Plan, Pemaco Superfund Site, 5050 E. Slauson Ave., Maywood, California* (TN&A, 2002).

The pilot tests were performed onsite and included the evaluation of HVDPE in the upper vadose/perched groundwater zone, as well as in the lower vadose/Exposition 'A' and 'B' groundwater zones. Calculations were performed to determine the radius of influence and contaminant mass recovery of the HVDPE system at various flow rates. The results were extrapolated to evaluate the technical and cost-effectiveness of a full-scale application of the technology as well as use of HVDPE to enhance the effectiveness of other remedial alternatives as a part of the Feasibility Study (FS) currently being prepared for the site.

BACKGROUND

The Pemaco Superfund Site is comprised of 1.4 acres located in a mixed industrial and residential neighborhood in Maywood, Los Angeles County, California (Figure 1). Pemaco, Inc. formerly operated as a custom chemical blender between the 1950's and 1991. A wide variety of chemicals were used on-site including chlorinated and aromatic solvents, flammable liquids, oils and specialty chemicals. These chemicals were stored in drums, aboveground storage tanks (ASTs) and underground storage tanks (USTs). The site was abandoned by its owner, but the stored chemicals, drums, ASTs and USTs were removed by 1998 under the supervision of the USEPA, Region IX. Environmental assessments performed between 1990 and 1999 have identified soil and groundwater contamination that originated from the use and storage of chemicals at the property. A soil vapor extraction (SVE) system was installed as an interim measure in 1998 and operated until 1999, when it was shut down due to community concerns with the associated thermal oxidation unit that was used as a part of the SVE.

The site entered into the Superfund program in 1999, and a full-scale Remedial Investigation was performed between January 2001 and November 2001. The City of Maywood, in conjunction with the Trust for Public Land, is planning to use the Pemaco property along with adjacent properties to build a public recreational park. This project is termed the Maywood Riverfront Park project. Future remedial activities of the Pemaco site and adjacent sites will be integrated with the existence of this park.

DESCRIPTION OF TECHNOLOGY

HVDPE, also known as multi-phase extraction or vacuum-enhanced extraction, is a technology that uses a high vacuum pump system to remove various combinations of contaminated ground water, "free product", and contaminant vapors from the subsurface. Extracted liquids and vapor are collected and treated at the surface prior to discharge.

In HVDPE systems for liquid/vapor treatment, a high vacuum system is used to remove liquid and gas from low permeability or heterogeneous formations. The vacuum extraction well includes a screened section in the targeted zone of contaminated soils and groundwater. Two "well configurations" are most common:

1. The vacuum pump may be attached to a "drop tube" which is placed at a selected depth below the top of groundwater in the well. The system lowers the water table around the well, exposing more of the formation to vapor extraction, thereby removing contaminants from above and below the water table. This method is especially effective in shallow, low-water-yield zones.

2. A variation of the above method employs the use of a submersible pump for groundwater extraction; high vacuum is then applied directly to the casing to enhance groundwater flow/dewatering of target stratigraphic intervals and to extract vapors from

the dewatered zones. This method is more commonly used for zones that are greater than 40 feet bgs.

In both of these configurations/methods, contaminants in the dewatered zone are then accessible to vapor extraction. Once above ground, the extracted vapors or liquid-phase organics and ground water are separated and treated. Use of HVDPE has been demonstrated to greatly shorten cleanup times and costs when compared with traditional pump and treat systems and vapor extraction.

DESCRIPTION OF FIELD ACTIVITIES

The HVDPE test for the upper vadose zone and perched groundwater zone (approximately 20 ft to 35 ft bgs) was conducted utilizing the drop-tube method described above. This test was performed using SV-01 as the extraction well and monitoring wells B-01, B-03, B-04 and B-05 as observation points. An additional double-nested vapor probe and observation well closer to SV-01 were also installed and used for the test (OB-1V and OB-1W, respectively). Figure 2 illustrates well locations used for the HVDPE test within the perched zone.

Individual HVDPE tests on the 'A' and 'B' Zones were performed utilizing a variable flow rate submersible pump (placed in the extraction wells) as the primary method of groundwater extraction. A drop-tube was also used in the latter portion of the 'A' Zone test to determine if this method could produce a higher sustainable groundwater yield.

A new 6-inch-diameter extraction well (RW-01-70) was installed for the lower vadose/'A' Zone test and was screened between 55 and 70 feet bgs. RW-01-95 was used as the extraction well for the lower vadose/'B' Zone test. For both 'A' and 'B' Zone tests, observation points included monitoring wells MW-14 through MW-19 (each well is double-nested with screen intervals in both the 'A' and 'B' Zones). An additional nearby shallow wells screened in the Perched Zone was also monitored during the 'A' Zone test to evaluate potential communication between the two zones.

Detailed methods and procedures for the above tests may be referenced in the *HVDPE Draft Work Plan, Pemaco Superfund Site, 5050 E. Slauson Ave., Maywood, California* (TN&A, 2002). A summary of the field activities and results associated with the HVDPE tests are described in the following sections.

HVDPE Test Well Installation/Setup

Nested Vapor Probe and Observation Well for Upper Vadose / Perched Zone Test

A new double-nested vapor probe, OB-1V, was installed at a distance of 10 feet from SV-01 (extraction well for perched zone test). The monitoring probe was used to monitor changes in vacuum levels in the subsurface during the HVDPE pilot test of the upper vadose/perched zone. The monitoring probe borehole contained two monitoring points. Each monitoring point consisted of a one-inch PVC casing with 12-inches of screen at the end. The monitoring screens were placed at depths of 10 feet and 20 feet bgs. Screen size was 0.030-inch slot size. Sand pack around each screened interval consisted of No. 3 sand extending a minimum of one foot above the well screen. Above the sand pack was a 5-foot bentonite seal, with the remaining annular space filled with a bentonite/cement grout mix.

A new observation well was drilled to a depth of 35 feet and was screened through the perched groundwater zone adjacent to the newly installed double-nested vapor probe (approximately 10 feet from SV-01). The screen interval was placed at 29.5 to 34.5 ft bgs. This was based upon local soil conditions observed during coring. A two-inch PVC casing was installed in the borehole with 5-feet of 0.010-inch slotted screen at the end. Sand pack around the screened interval consisted of coarse #2/16 sand extending a minimum of one foot above the well screen. Above the sand pack was a 5-foot bentonite seal, with the remaining annular space filled with a bentonite/cement grout mix.

Table 1A summarizes well construction data for wells screened within the perched groundwater zone. Attachment A contains the well construction diagram for OB-1V and OB-1W.

Extraction Well for 'A' Zone Test

A new extraction well was required for testing of the 'A' zone. The new well, RW-01-70, was drilled to a depth of 70 feet and was screened through the 'A' zone. A six-inch casing was placed in the borehole and completed as a dual phase extraction well. Stainless-steel well screen was attached to the casing and extended across the 'A' zone from approximately 55 feet to 70 bgs. The well screen will be 0.030-inch slot size. The sand packs around the screened intervals were sized based upon local soil conditions and consisted of No. 3 sand extending a minimum of two feet above the well screen, followed by 2 feet of fine silica sand (#0/30 sand). Above the sand pack was a five-foot bentonite seal, with the remaining annular space filed with a bentonite/cement grout mix.

Table 1B summarizes well construction data for wells screened within the Exposition groundwater zones. Attachment A contains the well construction diagram for RW-01-70.

All wells and monitoring points were constructed in accordance with the Pemaco Sampling and Analysis Plan (SAP) and California Well Standards Bulletin 74-81.

Process Flow and Setup

Each monitoring point to be used for the test was fitted with a pressure tight cap with a port for measuring vacuum levels. The caps were removable so that a water level probe could be placed down the well to check water level measurements. Additional installation activities included the construction and connection of pipe headers to the pumping system from the extraction wells. The headers route water and vapors to the treatment facility.

The basic flow of extracted fluids (water and vapors) during the tests was as follows: from the extraction well via the drop tube/submersible pump and header system to the knockout chamber. Due to the large volume of this chamber, the liquid phases dropped to the bottom of the tank via gravity while the vapor phase continued on to the vacuum pump. The effluent water from the system was directed through a header directly to the 6,000-gallon storage tank onsite. The vapors exiting the vacuum pump were connected to a vapor extraction (VE) system header for delivery to the vapor treatment unit (two 1,200-pound vapor-phase granular activated carbon vessels that were onsite for the test). A simplified process flow diagram is presented in Figure 3.

A sealed liquid ring vacuum pump was utilized for each test with capabilities of generating 28.5 inches of Hg with flow of over 150 SCFM (at 22 inches of Hg).

The system was placed close to the wells to minimize the length of the influent header that ran between the wells and the knockout chamber. All pressurized untreated liquid lines were double contained.

Monitoring of Process Flow Concentrations

Vapor samples were collected in Tedlar bags using a sampling "bell" from the extraction well wellheads and photo-ionization detector (PID) readings were taken from sample ports at the system influent, intermediate and effluent locations to monitor vapor concentrations during the test. During testing, two samples were collected from SV-01; one sample was collected from RW-01-70; and one sample was collected from RW-01-95. A sample was also collected from the effluent of the carbon unit to ensure South Coast Air Quality Management District (SCAQMD) compliance.

PID influent and effluent readings of organic vapor concentrations were measured regularly during all tests. The highest observed influent concentrations reached 980 ppm/v ('A' Zone test); maximum effluent concentrations were 8.4 ppm/v. It should be noted that background PID readings were 3.5 ppm at the site.

Only one influent water sample was collected during the testing. This sample was collected from RW-01-70. The other extraction wells have been sampled during previous monitoring events and aquifer testing events.

All Tedlar bag samples were analyzed for VOCs by EPA Method TO-15 by CalScience Environmental Laboratories, Inc., of Garden Grove, California. The water sample from RW-01-70 was analyzed for VOCs by EPA Method 8260B by the same laboratory. Table 2 summarizes all the laboratory results.

INVESTIGATION DERIVED WASTES (IDW)

All soil cuttings from the well installations (approximately 10 tons) and the water produced by well development and pilot testing activities (2,875 gallons) were hauled offsite by Haz-Mat Trans, Inc. of San Bernardino, Ca after proper characterization. Soil cuttings were transported to the Philadelphia Recycling Mine in Mira Loma, California and the liquid waste was transported to U.S. Filter Recovery Services of Vernon, California, for proper treatment and disposal.

The soil cuttings and waste water were sampled and analyzed for VOCs by EPA Method 8260; total metals by EPA Method 6010B/7470A; and total petroleum hydrocarbons (TPH) – total carbon range. Laboratory reports for these analyses are included in Attachment B.

FIELD SUMMARY AND OBSERVATIONS

For each HVDPE test, system operating parameters and data from monitoring points were recorded approximately every 15 to 30 minutes. Measured parameters included: depth to water, blower vacuum level, wellhead vacuum level, influent and effluent vapor concentrations, and system flow rates. As the parameters began to stabilize, the data was collected on a less frequent basis.

A summary of each HVDPE test and the parameters recorded during the tests are included in the following paragraphs.

Perched Zone Test

The HVDPE test for the perched zone started December 9, 2002 and operated for 3.6 hours, at which point the knockout pump shutdown. The system was restarted the following morning and operated successfully for 8.5 hours for a total operational time of 12.1 hours.

Initial startup resulted in transitional conditions in the subsurface as the extraction well was dewatered and the vacuum began to develop on the formation. The first activity during this transitional phase of the startup was positioning the drop tube, as the well was initially

dewatered. This process took less than 30 minutes before the drop tube reached its final position near the bottom of the well.

Vapor extraction flow rates averaged 65 cubic feet per minute (CFM) at 20 to 22 inches of mercury (Hg) at the blower vacuum; wellhead vacuums ranged from 12 to 14 inches of Hg after initial start-up. Groundwater extraction rates averaged 0.86 gallons per minute (gpm). The extraction well produced water throughout the duration of the test and did not totally de-water. Graph 1A illustrates groundwater levels in the observation wells during the test and Table 3 summarizes the drawdown data for each well. Graph 1B illustrates the vacuum levels observed at the extraction well, blower and observation wells during the test.

The general trend of groundwater levels in the perched zone was proportionate to vacuum levels. Graphs 2A through 2E illustrate the vacuum and water level versus time for each perched zone observation well. All operational data collected during the test is summarized in Table 4.

Influent PID readings ranged from 33 to 43 parts per million per volume (ppm/v) during the test and did not significantly fluctuate. These lower levels are probably due to remediation efforts (SVE system) previously performed at the site within this zone. The effluent vapor stream from the perched zone test was consistently zero ppm.

In-situ flow rates from individual wells were collected by fully inflating a Tedlar bag (1L volume) with atmospheric air and connecting it via tubing to some of the observation wells. Well OB-1V-20 (10' from SV-01) and well B-01 (54 feet from SV-01). Observed flow rates were 0.14 CFM (OB-1V-20) and 0.024 CFM (B-01).

Results of influent vapor samples collected from SV-01 for laboratory analyses are discussed in the *Data Analysis and Results* section below and summarized in Table 2.

Exposition 'A' and 'B' Zones

The 'A' and 'B' Zone tests were conducted using the same system as the perched zone test. However, the tests of the 'A' and 'B' zones used primarily a submersible pump for groundwater extraction; a vacuum was applied directly to the extraction well casing (RW-01-70 and RW-01-95, respectively) for vapor extraction and enhancement of groundwater flow rates. For each test (first 'A', then 'B'), initial startup included the pumping of water only using the submersible pump. Once near maximum steady-flow rate flow rates were obtained with maximum drawdown in the extraction well, vacuum was applied to the casing of the extraction well while continuing to pump groundwater from the submersible pump. During this time period, attempts to increase pumping rates were made to evaluate whether added vacuum would increase yield from the water-bearing zones. Each test was monitored for system-operating parameters as described above and are summarized in the following paragraphs by zone. Key operational parameters are summarized in Table 4.

'A' Zone Test

The submersible pump HVDPE test for the 'A' Zone operated for 24 hours during December 11th and December 12th, 2002. Vapor extraction flow rates averaged 81 CFM for the majority of the test at 23 to 24 inches of Hg at the blower vacuum; wellhead vacuums ranged from 18.5 to 23 inches of Hg. Sustained groundwater extraction rates ranged from 0.4 to 0.5 gpm. Towards the end of the test, the pumping rate was increased to 1.0 gpm to evaluate if the effects of a sustained vacuum increased yield from the water-bearing zones. The pump was continuously adjusted to maintain one gpm against the vacuum. The 1.0-gpm-flow rate was only sustained for 1.5 hours. Silt was a continual problem due to the 0.03-inch slotted screen size in the saturated zone of RW-01-70.

Groundwater levels in the observation wells recorded during the 'A' Zone down-hole pump test indicate an initial lowering of the water table followed by a gradual rebound after approximately 7.5 hours of operation, with exception to MW-18-70 where water levels continued to drop throughout the duration of the test. The pump rate was not continuous during the initial few hours of the test as a sustainable rate was attempted by trial and error. Pumping at 0.6 gpm or above caused excessive drawdown. Sustainable drawdown was achieved at 0.4 gpm, which was the flow rate for most of the test period. The increase in water levels in most of the observation wells during this extraction well flow rate indicates that under vacuum, the actual sustainable flow rate is likely closer to 0.5 gpm. After approximately 21.5 hours of operation, the flow rate was increased to 1.0 gpm, where excessive drawdown occurred after 1.5 hours of operation as described above.

The vacuum-assisted drop-tube HVDPE test was performed to determine if a higher flow rate could be sustained utilizing the drop-tube method. This test was performed after the down-hole pump test ended and lasted for 3.6 hours. The drop-tube method maintained a groundwater extraction flow rate of 1.1 gpm at 23 inches of Hg (blower vacuum) and 15 to 17 inches of Hg (wellhead vacuum). The wellhead vacuum levels were considerably lower than the down-hole pump method probably due to the increased unsaturated thickness caused by lowering the water table to the bottom of the well. The additional extraction rate is likely due to the increased water column available for extraction with the pump being removed. The pump itself was 2.8 feet long (intake near the top) and the water column in RW-01-70 was only 6.55 feet. No vapor stream flow rate measurements were collected during this test.

During the switch from the submersible pump method to the drop-tube method, groundwater levels rebounded, followed by another drop in water levels as a result of the drop-tube method test.

Graphs 4A through 4F illustrate the vacuum and water level versus time for each 'A' Zone observation well. It should be noted that MW-19-70 fluctuated at a much smaller degree than other 'A' Zone observation wells.

PID influent and effluent readings of organic vapor concentrations were measured regularly during the test with influent concentrations reaching 980 ppm. Graph 3 illustrates HVDPE vacuum data and influent vapor concentration levels for the 'A' Zone.

One in-situ airflow test (as described for the Perched Zone test above) was performed at MW-16-70 (10 feet from RW-01-70). A flow rate of 0.10 CFM was observed at this well, (see Graph 4C).

Perched Zone well B-13 was also monitored during the 'A' Zone test. No measurable vacuum was observed and groundwater levels did not fluctuate significantly in this well indicating that no hydraulic/fluid communication exists between the Perched Zone an 'A' Zone.

'B' Zone Test

Operation of the HVDPE test for the 'B' Zone lasted 21 hours during December 12th and December 13th, 2002. The submersible pump shut down overnight for 11.5 hours resulting in a total operational pumping time of 9.5 hours. Groundwater extraction flow rates ranged from 1.0 to 3.8 gpm and vacuum levels ranged from at 26 to 27 inches of Hg (blower vacuum) and from 24 to 26 inches of Hg (wellhead vacuum).

Initially, the well was pumped at 1.0 gpm without vacuum. Once the water level stabilized at 83' (top of the saturated zone), then the vacuum was applied and the pump was turned up to the maximum flow rate of 2.8 to 3.0 gpm. The well appeared to sustain this flow rate (2 hours of continual operation had occurred) and was left overnight. Upon returning in the morning, it was found that the pump had shut-off due to excessive drawdown (pump was fitted with a "low-water" probe that automatically shut the pump off if the water level reached the intake port). It was estimated that the pump ran for a total of 58 minutes after the field crew had left the site (estimated from extracted water volume). The well sustained a pumping rate of 2.8 to 3.0 gpm for approximately 2 hours total. During the remainder of the test the maximum flow rate was still attempted causing continual pump shut-offs due to excessive drawdown (pump would shut off approximately every 2 hours). After sufficient re-charge time (usually a few minutes) the pump would be turned back on at the maximum rate. This was done to achieve the maximum cone of depression to try and expose the observation well screens to vapor extraction. Approximately 6 hours of this type of pumping was done and the nearest observation well (10-feet away) still had water levels more than 10 feet above the top of the well screen. This indicated that the cone of depression around the extraction well was too steep to allow for significant de-watering of the 'B' Zone sediments in order to expose them to vapor extraction. No measurable vacuum levels were observed in any of the observation wells.

Graphs 5A through 5F illustrate the observation well groundwater level, extraction well flow rate, and vacuum levels versus time for each 'B' Zone observation well.

No significant influent PID readings (all <10 ppb/v) were recorded during the 'B' Zone test. This was likely due to the inability of the pumping and vacuum to expose the contaminated sediments to vapor extraction. The only area that was being exposed to vapor extraction was the area immediately adjacent (<10 feet) to the extraction well.

LABORATORY RESULTS AND DATA ANALYSIS

Vapor and Groundwater Analytical Results

Laboratory samples obtained at the wellhead of SV-01 during the perched zone HVDPE pilot test were collected in Tedlar bags and analyzed for VOCs by EPA Method TO-15. One sample was collected after approximately 4 hours of operation and one sample was collected after 8.5 hours of operation. The following analytes were detected at concentrations ranging from 3.2 to 200 ppb/v: benzene, 1,1-dichloroethane (DCA), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (DCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), ethylbenzene, methyl tert-Butyl ether (MTBE), tetrachloroethene (PCE), toluene, 1,1,1-trichloroethane (TCA), trichloroethene (TCE), 1,2,4-trimethylbenzene, vinyl chloride, and total xylenes. Analytical results for vapor samples collected at the wellhead of SV-01 are summarized in Table 2.

Similar analytes were detected in vapor samples collected at the wellheads of RW-01-70 and RW-01-95 during the 'A' and 'B' Zone HVDPE tests. Concentrations of soil vapors extracted from the 'A' Zone (and Lower Vadose Zone) were much higher than those detected in the Perched Zone, ranging in concentrations from 290 ppb/v to 190,000 ppb/v. 'B' Zone vapor concentrations were lower than both the perched and 'A' Zones, with concentrations ranging from 2.2 to 89 ppb/v. Analytical results for vapor samples collected from RW-01-70 and RW-01-95 are summarized in Table 2.

Effluent results of the soil vapor treatment system (carbon vessels) utilized during the HVDPE pilot test, indicated concentrations of acetone, ethylbenzene, methylene chloride, toluene, and total xylenes. Concentrations of ethylbenzene, methylene chloride, and total xylenes exceeded ambient air standards (Region 9 PRGs for ambient air). It should be noted that methylene chloride was not detected in any influent vapor samples. Likewise, effluent concentrations of ethylbenzene and total xylenes were higher than those concentrations detected in influent samples. These elevated concentrations are likely the result of equipment or laboratory cross contamination.

A groundwater sample was collected from RW-01-70 during the 'A' Zone HVDPE test. The following analytes (and concentrations) were detected: benzene (1.0 ug/L), chloroform (1.5 ug/L), DCA (1.3 ug/L), DCE (5.5 ug/L), cis-1,2-DCE (1,400 ug/L), trans-1,2-DCE (27 ug/L), PCE (5.2 ug/L), toluene (3.3 ug/L), TCE (15,000 ug/L), vinyl chloride (68 ug/L), and total xylenes

(1.43 ug/L). These results are consistent with concentrations in samples from other nearby wells screened in the 'A' Zone. Table 2 summarizes the water data from well RW-01-70.

Attachment B contains the laboratory reports for all samples analyzed by a fixed laboratory as a part of the pilot test.

Observed Influence/System Performance

Perched Zone

A total of 625 gallons of water was extracted from SV-01 at a sustained flow rate of 0.8 gpm for the duration of the test (12.1 hours). Drawdown in surrounding monitoring wells ranged from 4.32 feet (OB-1W, 10 feet from the recovery well, SV-01) to 0.61 feet (B-01, 54 feet from SV-01). Based on this data, the groundwater extraction radius of influence (ROI) is estimated at 72 feet and is illustrated in Graph 6A. Actual time influenced ROI is likely larger than this as indicated by the water levels in the outlying observation wells. These levels were still dropping at the end of the test. This groundwater ROI was achieved with blower vacuum levels of 20 to 22 inches of Hg and an average wellhead vacuum of 13 inches of Hg, resulting in an estimated vapor extraction ROI of 54 feet, illustrated in Graph 6B. The non-uniform vacuum levels observed (in regard to distance from the extraction well, see Graph 6B), indicates that heterogeneous soil conditions exist in the perched zone.

Figure 4 is a geologic cross section through the Perched Zone test area illustrating both the static and pumping groundwater tables during the HVDPE test. Figures 5 and 6 illustrate the pre-pumping groundwater gradient and the pumping groundwater gradient in the test area, respectively. The cone of depression suggests a rather flat and widespread lowering of the water table. Overall, data from the test suggests that HVDPE can result in a significant dewatering of the perched groundwater zone exposing normally saturated material to vapor extraction. Due to the low-yielding and heterogeneous nature of the saturated thickness' found in the Perched Zone, it is plausible that continual application of HVDPE to the Perched Zone could result in a total de-watering of the zone after weeks or months of operation.

'A' Zone

A total of 606 gallons of water was extracted from the 'A' Zone during the two tests. The drop-tube method allowed for a higher sustained flow rate (1.1 gpm) than the submersible pump test (0.4 to 0.5 gpm), indicating that the drop-tube method is more effective at dewatering the 'A' Zone. Drawdown in surrounding monitoring wells ranged from 3.09 feet (MW-16-70, 10 feet from RW-01-70) to 0.52 feet (MW-14-80, 104 feet RW-01-70) during the 'A' Zone drop-tube HVDPE test (range during submersible pump test was only 2.45 to 0.51 ft at the same observation wells). This was due to the pump itself taking up nearly half of the available water column.

Based on the observed data, the groundwater extract ROI is estimated at 175 feet and is illustrated in Graph 7A. This was achieved with an average blower vacuum level of 23 inches of Hg and an average wellhead vacuum of 16 inches of Hg (compared to submersible pump average of 20.75 inches of Hg), resulting in an estimated vapor ROI of 37 feet and is illustrated in Graph 7B.

The increased drawdown, lower vacuum levels and increased average influent concentrations using the drop-tube method indicates that it is more effective for remediation of the 'A' Zone than the down-hole pump method. However, both methods appear to be feasible for remediating the 'A' Zone.

'B' Zone

HVDPE utilizing the submersible pump method allowed for a sustained flow rate between 2.0 and 2.5 gpm within the 'B' Zone, nearly doubling the non-vacuum sustained maximum yield of 1.2 gpm, estimated during an aquifer test performed in December 2001. A total of 811 gallons of water was extracted from the 'B' Zone during the test. Drawdown in surrounding monitoring wells ranged from 7.51 feet (MW-16-90, 10.5 feet from RW-01-95) to 4.00 feet (MW-19-90, 31.3 feet from RW-01-95). Based on this data, the groundwater extraction ROI is estimated at 69 feet and is illustrated in Graph 8. Figure 7 illustrates the groundwater gradient in the 'B' Zone during the HVDPE test. The actual ROI is probably higher as the outlying well MW-14-90 was not used for this estimation. This was achieved with an average blower vacuum level of 26.5 inches of Hg at the blower vacuum and an average wellhead vacuum of 25 inches of Hg. The vapor ROI is effectively zero due to the saturated screens of the observation wells (i.e. water table was not lowered below screen intervals).

While HVDPE clearly increases the sustainable flow rates to recover contaminated groundwater for treatment, the zone was not adequately dewatered to expose sediments located between 75 to 95 feet bgs to vapor extraction. In turn, the extraction of VOCs from this lithosome was minimal, as influent vapor concentrations indicate (<10 ppm).

CONCLUSIONS

The purpose of the HVDPE treatability study at the Pemaco site was to evaluate the effectiveness of the technology to remediate the unsaturated and saturated zones beneath the site. The treatability study also sought to collect additional operational data that may be used to design a full scale system. The following conclusions and recommendations were identified on the performance of the HVDPE system during the treatability study/pilot test.

Perched Zone

- Conditions are very favorable in the Perched Zone/Upper Vadose Zone for effective remediation using HVDPE using the drop-tube method.

- Effective vapor extraction ROI for the Perched Zone/Upper Vadose Zone sediments = 54 feet
- Estimated groundwater ROI for the Perched Zone = 72 feet
- Groundwater flow rates averaging 0.8 gpm were attained using HVDPE (typically <0.10 gpm with no vacuum applied)

'A' Zone

- Conditions are favorable for the 'A' Zone/Lower Vadose Zone for effective remediation using HVDPE. The drop-tube method was found to be more effective than the down-hole pump method.
- Effective vapor extraction ROI for 'A' Zone sediments = 37 feet (both methods)
- Groundwater ROI for 'A' Zone groundwater = 175 feet (both methods)
- Groundwater flow rates of 1.1 gpm were attained using HVDPE with the drop tube method (typically <0.25 gpm with no vacuum applied).
- Maximum Influent concentrations exceeded 900 ppm/v, average concentrations were higher during drop-tube method.

'B' Zone

- Conditions are not favorable for HVDPE to effectively remediate the 'B' Zone. However, HVDPE does increase sustainable groundwater extraction rates.
- Effective vapor extraction ROI for 'B' Zone sediments = 0 feet
- Estimated groundwater ROI for 'B' Zone groundwater = 69 feet or greater
- Estimated sustainable groundwater flow rates of 2.0 to 2.5 gpm were attained using HVDPE (typically 1.1 gpm with no vacuum applied).

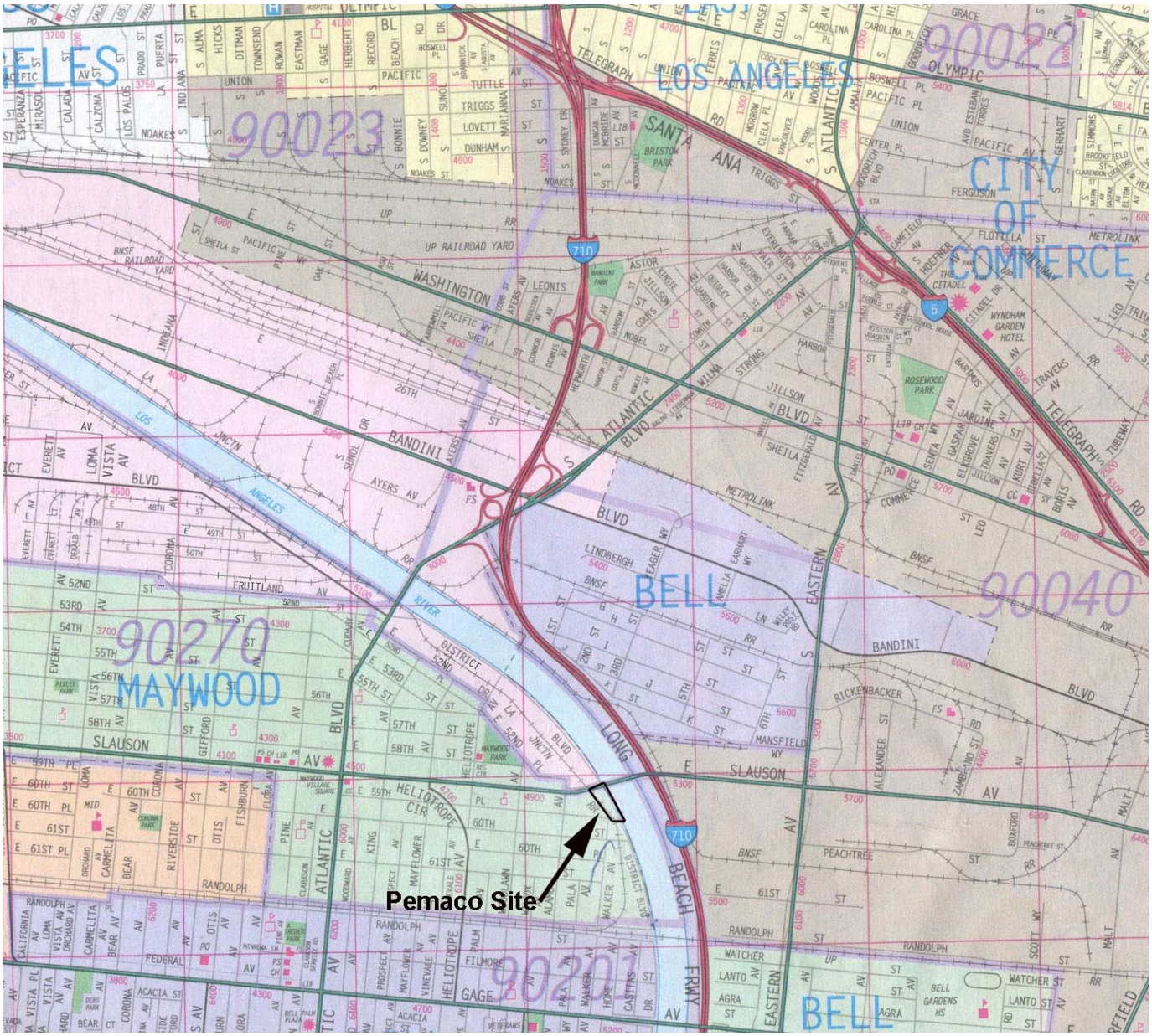
FIGURES

TABLES

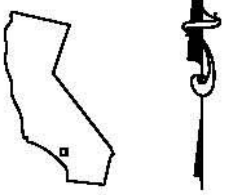
GRAPHS

ATTACHMENTS

FIGURES



LEGEND



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11/5/2000	PEMACO-SL	

SITE LOCATION MAP

PEMACO, INC.
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE 1

STREET

SLAUSON AVENUE

6" CURB

6" CURB

ASPHALT

SIDEWALK

9" CONCRETE WALL

TOE OF SLOPE

TOP OF SLOPE

4' WALK WAY

ASPHALT

SIDEWALK

B-37

B-17 STAIRS

CATCH BASIN

8" RETAINING WALL

8" CONCRETE WALL

CONCRETE EDGE

CONCRETE

DIRT

PEMACO SITE BOUNDARY

EDGE OF PAVEMENT

MW-1

B-18

SV-3

SV-2

DIRT

Perched Zone Extraction Well

B-1

B-3

B-32

B-19

SV-1

OB-1W

OB-1V

B-5

B-4

CONCRETE EDGE

MANIFOLD AREA

B-39

B-31

WW-MW-8

B-6

SV-4

B-7

B-16

CONCRETE

TOP OF SLOPE

TOE OF SLOPE

B-8

MW-14

DIRT

WW-MW-2

WW-MW-7

B-15

B-20

B-30

B-10

WW-MW-3

B-14

6" CONCRETE WALL

6" CONCRETE WALL

WW-MW-1

CONCRETE PAD

WW-MW-5

SV-5

MW-2

B-11

DIRT

DIRT

WW-MW-4

WW-MW-6

'A' and 'B' Zone Extraction Wells

MW-15-70

MW-15-85

MW-16-70/90

RW-01-70

RW-01-95

B-13

MW-18-70/85

MW-17-70/85

MW-17-95

B-12

MW-19-70/90

B-21

HEADWALL

CONCRETE

MW-6

B-29

N82°57'26"W

SIDEWALK

DRIVEWAY

8" CURB

SIDEWALK

DRIVEWAY

B-28

ASPHALT

699.45'

ASPHALT

B-27

SIDEWALK

GUTTER

B-22

102.26'

ASPHALT

FD SPK/W

86.28'

FD L&T

LOS ANGELES RIVER

LEGEND

B-6	MONITORING WELL, PERCHED ZONE (<35 FEET BGS.)
MW-2	MONITORING WELL, UPPER EXPOSITION AQUIFER (WELLS SCREENED IN INTERVAL BETWEEN 60 FEET AND 170 FEET BGS.)
RW-01	RECOVERY WELL LOCATIONS
B-05/ MW-15-85	OBSERVATION WELLs DURING HVDPE TEST

0 40 80

APPROXIMATE SCALE IN FEET

DATE:	FILE NAME:	APPROVED BY:
2/28/2002	PEMACO-40-BASE.DWG	

SITE PLAN ILLUSTRATING WELL LOCATIONS FOR HVDPE PILOT TEST

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
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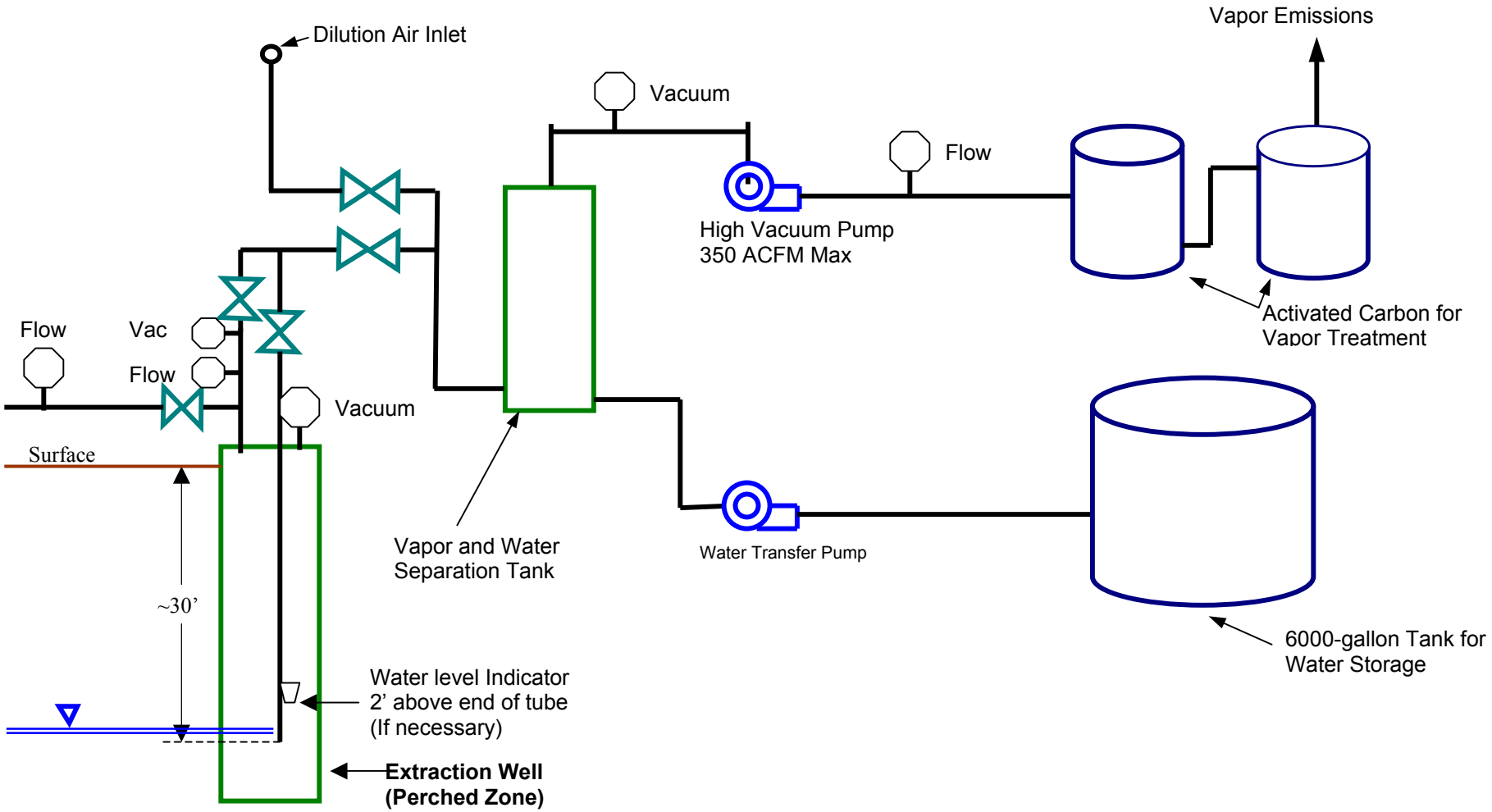
FIGURE 2

FIGURE 3

PEMACO HVDPE PILOT REMEDIATION TEST
SIMPLIFIED FLOW DIAGRAM



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A
NORTHEAST

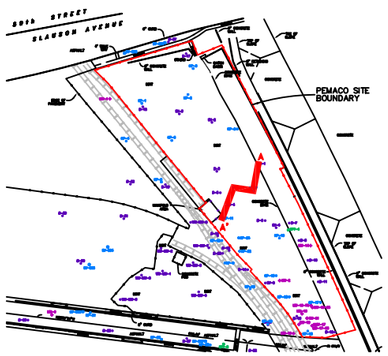
A'
SOUTHWEST

B–01 HP–07 OB–1W (OFFSET) SV–01 B–05 (OFFSET) B–04 HP–11

0
10
20
30
40
50

STATIC WATER LEVEL

PUMPING WATER LEVEL



CROSS SECTION INDEX MAP

LEGEND

WELL SCREEN INTERVAL

COARSE–GRAINED LITHOSOMES

FINE–GRAINED LITHOSOMES

10
0 10
APPROX. SCALE IN FEET

DATE:	FILE NAME:	APPROVED BY:
4/7/2003	PEMCSA2.DWG	

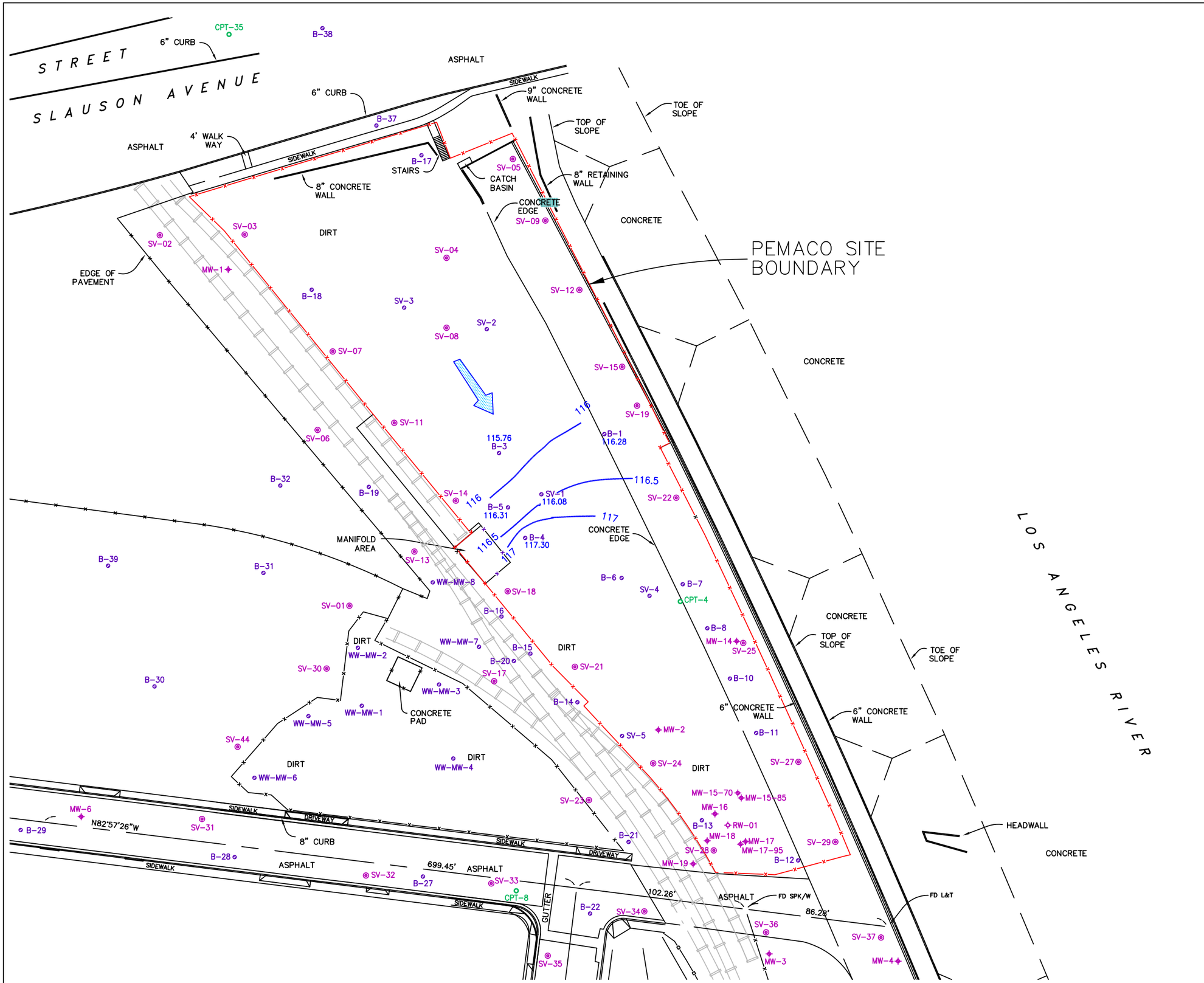
GEOLOGIC CROSS SECTION AND CONE OF DEPRESSION PERCHED ZONE

PEMACO SUPERFUND SITE

5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE 4



LEGEND

B-6	MONITORING WELL, PERCHED ZONE (<35 FEET BGS.)
MW-2	MONITORING WELL, UPPER EXPOSITION AQUIFER (WELLS SCREENED IN INTERVAL BETWEEN 60 FEET AND 170 FEET BGS.)
RW-01	RECOVERY WELL LOCATION
SV-2	SOIL VAPOR EXTRACTION WELL, PERCHED ZONE
SV-23	SOIL VAPOR SAMPLING POINT (SAMPLE COLLECTED FROM 5 FEET BGS.)
CPT-13	CONE PENETRATION TESTING LOCATION
	GROUNDWATER FLOW DIRECTION

0 60 120

APPROXIMATE SCALE IN FEET

DATE:	FILE NAME:	APPROVED BY:
4/3/2003	PEM-SPP.DWG	

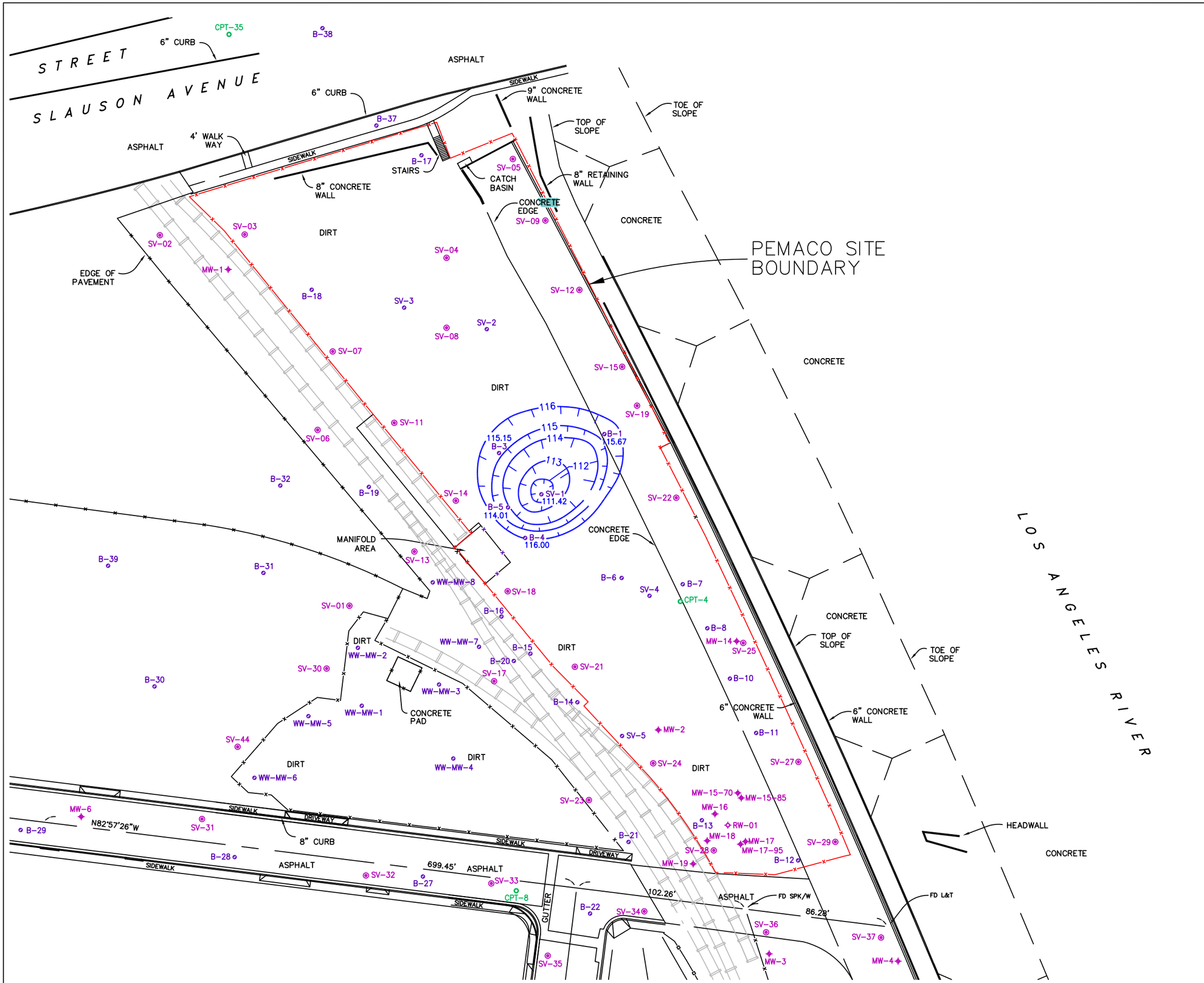
STATIC (PRE-PUMPING) GROUNDWATER GRADIENT, PERCHED ZONE

PEMACO SUPERFUND SITE

5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE 5



LEGEND

B-6	MONITORING WELL, PERCHED ZONE (<35 FEET BGS.)
MW-2	MONITORING WELL, UPPER EXPOSITION AQUIFER (WELLS SCREENED IN INTERVAL BETWEEN 60 FEET AND 170 FEET BGS.)
RW-01	RECOVERY WELL LOCATION
SV-2	SOIL VAPOR EXTRACTION WELL, PERCHED ZONE
SV-23	SOIL VAPOR SAMPLING POINT (SAMPLE COLLECTED FROM 5 FEET BGS.)
CPT-13	CONE PENETRATION TESTING LOCATION

0 60 120

APPROXIMATE SCALE IN FEET

DATE:	FILE NAME:	APPROVED BY:
4/3/2003	PEM-PG.DWG	

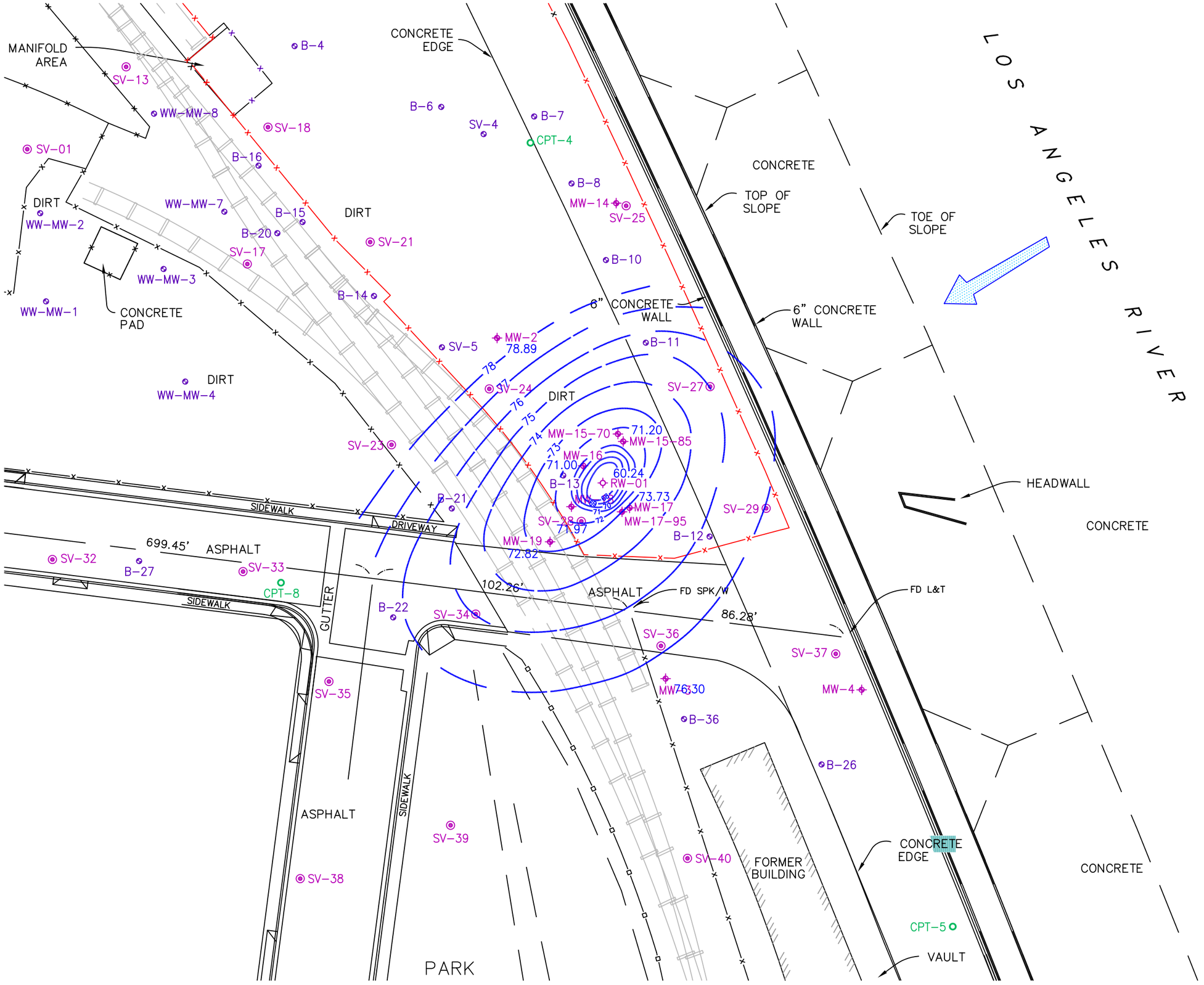
PUMPING GRADIENT/CONE OF DEPRESSION PERCHED ZONE

PEMACO SUPERFUND SITE

5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE 6



LEGEND

B-6	MONITORING WELL, PERCHED ZONE (<35 FEET BGS.)
MW-2	MONITORING WELL, UPPER EXPOSITION AQUIFER (WELLS SCREENED IN INTERVAL BETWEEN 60 FEET AND 170 FEET BGS.)
RW-01	RECOVERY WELL LOCATION
SV-2	SOIL VAPOR EXTRACTION WELL, PERCHED ZONE
SV-23	SOIL VAPOR SAMPLING POINT (SAMPLE COLLECTED FROM 5 FEET BGS.)
CPT-13	CONE PENETRATION TESTING LOCATION
68	GROUNDWATER ELEVATION CONTOUR LINE
60.24	GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
	STATIC 'B' ZONE GROUNDWATER FLOW DIRECTION

0 60 120

APPROXIMATE SCALE IN FEET

DATE:	FILE NAME:	APPROVED BY:
4/3/2003	PEM-GGM-COD-HVDPE.DWG	

PUMPING GRADIENT/CONE OF DEPRESSION 'B' ZONE

PEMACO SUPERFUND SITE

5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE 7

TABLES

Table 1A
Well Construction Data - Perched Groundwater Zone
Pemaco Superfund Site
5050 E. Slauson Avenue, Maywood, California

Well I.D.	Date Installed	Northing	Easting	Top of Casing Elevation	Vault Cover Elevation	Ground Surface Elevation	Casing Diameter (inches)	Well Material	Screening Interval	Screen Slot Size (inches)	Filter Pack Sand Size	Constructed Total Depth	Measured Total Depth
B-01	07/19/90	1817183.99	6509516.29	147.84	--	--	2	PVC	--	--	Pea Gravel	35	35.00
B-03	07/18/90	1817172.57	6509452.98	146.06	--	--	2	PVC	--	--	Pea Gravel	40	41.00
B-04	07/18/90	1817121.53	6509468.70	145.92	--	--	2	PVC	--	--	Pea Gravel	40	36.00
B-05	07/18/90	1817139.90	6509458.37	145.91	--	--	2	PVC	--	--	Pea Gravel	40	36.00
B-06	07/19/90	1817097.47	6509526.68	146.36	--	--	2	PVC	--	--	Pea Gravel	45	Obstructed at 8' bg
B-07	07/18/90	1817093.69	6509563.42	146.64	--	--	2	PVC	--	--	Pea Gravel	30	28.80
B-08	07/19/90	1817067.20	6509578.20	146.32	--	--	2	PVC	--	--	Pea Gravel	--	30.00
B-10	07/19/90	1817036.93	6509591.80	145.50	--	--	2	PVC	--	--	Pea Gravel	35	32.00
B-11	07/20/90	1817004.23	6509607.57	144.57	--	--	2	PVC	--	--	Pea Gravel	25	25.00
B-12	07/18/90	1816927.58	6509632.80	142.36	--	--	2	PVC	--	--	Pea Gravel	25	24.00
B-13	07/20/90	1816951.73	6509574.91	140.26	--	--	2	PVC	--	--	Pea Gravel	35	30.00
B-14	07/20/90	1817022.70	6509500.08	141.55	--	--	2	PVC	--	--	Pea Gravel	30	23.00
B-15	07/20/90	1817051.94	6509471.83	141.05	--	--	2	PVC	--	--	Pea Gravel	35	31.50
B-16	07/20/90	1817074.26	6509454.45	141.39	--	--	2	PVC	--	--	Pea Gravel	35	23.00
B-17	04/16/01	1817351.65765779	6509406.34185294	150.30	150.61	150.50	1.5	Schedule 40 PVC	33 - 43	0.010	20/40	43	42.90
B-18	04/16/01	1817270.76487070	6509340.32725634	147.05	147.50	147.40	1.5	Schedule 40 PVC	24 - 29	0.010	20/40	29	28.50
B-19	04/18/01	1817152.21032391	6509374.68210412	143.58	143.75	143.60	1.5	Schedule 40 PVC	22 - 32	0.010	20/40	32	31.65
B-20	04/19/01	1817047.52634224	6509461.88110673	141.40	141.89	141.70	1.5	Schedule 40 PVC	22 - 32	0.010	20/40	32	32.10
B-21	04/16/01	1816938.69098282	6509530.85939496	140.20	140.44	140.30	1.5	Schedule 40 PVC	23 - 28	0.010	20/40	28	27.85
B-22	04/18/01	1816895.62218899	6509507.68590426	138.12	138.41	138.38	1.5	Schedule 40 PVC	20 - 25	0.010	20/40	25	24.50
B-23	04/18/01	1816710.68891235	6509489.13838956	137.43	137.73	137.69	1.5	Schedule 40 PVC	19 - 24	0.010	20/40	24	23.90
B-24	04/16/01	1816717.14312994	6509625.75764029	138.20	138.57	138.40	1.5	Schedule 40 PVC	22 - 27	0.010	20/40	27	26.95
B-25	04/17/01	1816742.46665634	6509714.16346814	137.84	138.10	138.08	1.5	Schedule 40 PVC	18 - 23	0.010	20/40	23	22.53
B-26	04/17/01	1816837.46377518	6509677.05741614	139.66	139.90	139.90	1.5	Schedule 40 PVC	18 - 23	0.010	20/40	23	22.78
B-27	04/17/01	1816917.90003661	6509407.21703202	138.50	138.71	138.68	1.5	Schedule 40 PVC	21 - 26	0.010	20/40	26	25.74
B-28	04/17/01	1816929.58504548	6509294.00513734	138.67	138.87	138.85	1.5	Schedule 40 PVC	21 - 26	0.010	20/40	26	25.70
B-29	04/17/01	1816945.89123575	6509165.33403617	138.85	139.10	139.07	1.5	Schedule 40 PVC	22 - 27	0.010	20/40	27	26.80
B-30	04/16/01	1817032.22368902	6509245.81735845	143.60	143.79	143.80	1.5	Schedule 40 PVC	23 - 28	0.010	20/40	28	28.00
B-31	04/16/01	1817100.47996941	6509311.29722791	140.38	140.80	140.70	1.5	Schedule 40 PVC	20 - 25	0.010	20/40	25	24.72
B-32	04/17/01	1817153.02765714	6509321.44622878	141.45	141.69	141.63	1.5	Schedule 40 PVC	20 - 30	0.010	20/40	30	29.52
B-33	11/07/01	1816649.97763408	6509752.82624065	137.59	137.78	137.76	1.5	Schedule 40 PVC	21 - 26	0.010	20/40	26	25.96
B-34	11/08/01	1816558.24316450	6509788.03050540	137.21	137.56	137.55	1.5	Schedule 40 PVC	19 - 24	0.010	20/40	24	23.68
B-35	11/07/01	1816629.32401275	6509670.07710503	138.03	138.42	138.30	1.5	Schedule 40 PVC	23 - 28	0.010	20/40	28	27.78
B-36	11/07/01	1816855.42970305	6509622.67647721	139.78	140.00	139.80	1.5	Schedule 40 PVC	23 - 28	0.010	20/40	28	28.00
B-37	11/08/01	1817369.53616122	6509379.23316034	153.78	153.97	153.80	1.5	Schedule 40 PVC	31 - 36	0.010	20/40	36	36.11
B-38	01/09/02	1817428.12776000	6509346.79741000	153.33	153.59	153.56	2	Schedule 40 PVC	29 - 34	0.010	2/16	34	34.78
B-39	11/08/01	1817104.79004773	6509217.89912279	140.08	140.32	140.10	1.5	Schedule 40 PVC	18 - 28	0.010	20/40	28	28.25
SV-1	11/01/97	1817147.76481511	6509478.45017901	146.10	146.33	146.20	4	Schedule 40 PVC	10 - 35	0.020	2/16	35	34.00
SV-2	12/01/97	1817247.08599699	6509445.60435200	148.36	148.65	148.60	4	Schedule 40 PVC	15 - 35	0.020	2/16	35	34.00
SV-3	12/01/97	1817260.03006567	6509395.92432370	148.27	148.61	148.50	4	Schedule 40 PVC	15 - 35	0.020	2/16	35	34.40
SV-4	12/01/97	1817086.72137137	6509543.45140799	146.19	146.48	146.30	4	Schedule 40 PVC	15 - 35	0.020	2/16	35	33.40
SV-5	12/01/97	1817002.42853345	6509526.95076490	140.91	141.14	141.10	4	Schedule 40 PVC	15 - 35	0.020	2/16	35	29.00
OB-1V-10	11/22/02	--	--	--	--	--	2	Schedule 40 PVC	9 - 10	0.030	No.3	11	10.00
OB-1V-20	11/22/02	--	--	--	--	--	2	Schedule 40 PVC	18 - 19	0.030	No.3	20	20.00
OB-1W	11/22/02	--	--	--	--	--	2	Schedule 40 PVC	29.5 - 34.5	0.010	2/16	35.5	35.50

Wells B-2 and B-9 destroyed during UST removal activities (1997)

Table 1B
Well Construction Data - Exposition Aquifer Wells
Pemaco Superfund Site
5050 E. Slauson Avenue, Maywood, California

Well I.D.	Associated Hydrogeologic Unit	Date Installed	Northing	Easting	Top of Casing Elevation	Vault Cover Elevation	Ground Surface Elevation	Casing Diameter (inches)	Well Material	Screening Interval	Screen Slot Size (inches)	Filter Pack Sand Size	Constructed Total Depth	Measured Total Depth (from top of casing)
MW-01-80	A and B Zones	05/17/97	1817283.00000000	6509290.20000000	146.04	146.53	146.60	2	Schedule 40 PVC	59 - 79	0.020	No. 3	79	79.00
MW-02-95	B Zone	05/13/97	1817006.10000000	6509548.80000000	144.61	145.08	145.07	2	Schedule 40 PVC	80 - 100	0.020	No. 3	100	94.00
MW-03-85	A and B Zones	05/15/97	18168741.40000000	6509615.50000000	139.50	139.76	139.80	2	Schedule 40 PVC	64 - 84	0.020	No. 3	84	84.00
MW-04-85	A and B Zones	05/14/97	1816867.00000000	6509692.90000000	140.42	140.72	140.72	2	Schedule 40 PVC	64 - 84	0.020	No. 3	84	84.00
MW-05-85	A and B Zones	03/23/01	1816734.27450178	6509491.41700852	137.30	137.83	137.78	4	Schedule 80 PVC	70 - 85	0.010	2/16	85	85.50
MW-05-135	D Zone	04/02/01	1816726.80996294	6509490.50320641	137.57	137.78	137.75	4	Schedule 80 PVC	126 - 136	0.010	2/16	136	136.00
MW-06-85	B Zone	03/27/01	1816953.90070024	6509201.74183996	138.66	139.08	139.07	4	Schedule 80 PVC	79 - 84	0.010	2/16	84	83.32
MW-07-75	A Zone	03/26/01	1816531.15063185	6509817.14380646	137.19	137.55	137.52	4	Schedule 80 PVC	65 - 75	0.010	2/16	75	75.60
MW-07-130	D Zone	04/05/01	1816447.78980932	6509845.60781631	136.97	137.30	137.27	4	Schedule 80 PVC	120 - 130	0.010	2/16	130	129.00
MW-08-70	A Zone	03/28/01	1816346.90648686	6509419.24817233	136.90	137.09	137.06	2	Schedule 40 PVC	63 - 68	0.010	2/16	68	68.80
MW-08-85	B Zone	03/28/01	1816346.90648686	6509419.24817233	136.84	137.09	137.06	2	Schedule 40 PVC	79 - 84	0.010	2/16	84	85.70
MW-09-70	A Zone	03/30/01	1816611.10622807	6509258.06094839	137.44	137.85	137.80	2	Schedule 40 PVC	65 - 70	0.010	2/16	70	69.20
MW-09-85	B Zone	03/30/01	1816611.10622807	6509258.06094839	137.53	137.85	137.80	2	Schedule 40 PVC	80 - 85	0.010	2/16	85	84.82
MW-10-75	A Zone	04/02/01	1816416.05931249	6508720.43227137	138.53	138.83	138.82	2	Schedule 40 PVC	68 - 73	0.010	2/16	73	72.83
MW-10-90	B Zone	04/02/01	1816416.05931249	6508720.43227137	138.49	138.83	138.82	2	Schedule 40 PVC	87 - 92	0.010	2/16	92	91.50
MW-10-110	C Zone	04/06/01	1816426.52265935	6508721.65478435	138.52	138.89	138.87	4	Schedule 80 PVC	100 - 110	0.010	2/16	110	109.20
MW-10-170	E Zone	04/05/01	1816420.97509543	6508721.09554585	138.59	138.84	138.83	4	Schedule 80 PVC	163 - 173	0.010	2/16	173	173.91
MW-11-100	C Zone	03/29/01	1816185.04250091	6509927.40579395	136.08	136.52	136.50	4	Schedule 80 PVC	95 - 100	0.010	2/16	100	99.20
MW-12-70	A Zone	04/03/01	1816799.51171400	6508772.16883639	138.56	138.82	138.79	2	Schedule 40 PVC	65 - 70	0.010	2/16	70	70.25
MW-12-90	B Zone	04/03/01	1816799.51171400	6508772.16883639	138.58	138.82	138.79	2	Schedule 40 PVC	85 - 90	0.010	2/16	90	89.99
MW-12-150	D Zone	04/10/01	1816794.09761911	6508771.37970660	138.56	138.80	138.77	4	Schedule 80 PVC	138 - 148	0.010	2/16	148	147.36
MW-13-85	B Zone	04/04/01	1816563.36384668	6509621.22415847	137.72	138.17	138.16	4	Schedule 80 PVC	80 - 85	0.010	2/16	85	85.00
MW-14-80	A Zone	11/14/01	1817059.40321135	6509595.86566360	146.02	146.33	146.34	2	Schedule 40 PVC	76 - 81	0.010	2/16	81	80.55
MW-14-90	B Zone	11/14/01	1817059.40321135	6509595.86566360	145.93	146.33	146.34	2	Schedule 40 PVC	87 - 92	0.010	2/16	92	92.35
MW-15-70	A Zone	11/28/01	1816968.13830192	6509596.53768024	142.52	142.97	142.70	2	Schedule 40 PVC	63 - 68	0.010	2/16	68	68.43
MW-15-85	B Zone	11/19/01	1816965.16498740	6509598.63270074	141.94	143.06	142.70	2	Schedule 40 PVC	80 - 85	0.010	2/16	85	85.45
MW-16-70	A Zone	11/15/01	1816955.55635096	6509582.80914877	140.80	141.27	140.90	2	Schedule 40 PVC	63 - 68	0.010	2/16	68	68.61
MW-16-90	B Zone	11/15/01	1816955.55635096	6509582.80914877	140.77	141.27	140.90	2	Schedule 40 PVC	84 - 89	0.010	2/16	89	89.32
MW-17-70	A Zone	11/26/01	1816938.93248240	6509601.14853236	141.27	141.80	141.60	2	Schedule 40 PVC	63 - 68	0.010	2/16	68	68.46
MW-17-85	B Zone	11/26/01	1816935.67191000	6509602.55643000	141.28	141.76	141.50	2	Schedule 40 PVC	78 - 83	0.010	2/16	83	83.44
MW-17-95	B Zone	11/28/01	1816934.37572000	6509598.87584000	140.85	141.38	141.20	2	Schedule 40 PVC	90 - 92.5	0.010	2/16	92.5	93.15
MW-18-70	A Zone	11/16/01	1816939.40304123	6509578.15832437	139.49	140.03	139.80	2	Schedule 40 PVC	62 - 67	0.010	2/16	67	66.98
MW-18-85	B Zone	11/16/01	1816939.40304123	6509578.15832437	139.29	140.03	139.80	2	Schedule 40 PVC	81 - 86	0.010	2/16	86	85.40
MW-19-70	A Zone	11/27/01	1816925.50580914	6509569.71093735	139.25	139.98	139.80	2	Schedule 40 PVC	62 - 67	0.010	2/16	67	69.57
MW-19-90	B_2 Zone	11/27/01	1816925.50580914	6509569.71093735	139.59	139.98	139.80	2	Schedule 40 PVC	82 - 87	0.010	2/16	87	88.43
RW-01-70	A Zone	11/22/02	--	--	--	--	--	6	Stainless Steel, V-wrap	55 - 70	0.030	No.3 and 0/30	70	70.00
RW-01-95	B Zone	11/20/01	1816948.78059864	6509590.56447219	141.14	141.49	141.20	6	Stainless Steel, V-wrap	80 - 95	0.020	2/12 and 2/16	95	94.55

TABLE 2
Soil Vapor Sample Analytical Results
Pemaco Superfund Site, Maywood, California

Compound	Influent Vapor Samples (Collected at Wellhead)				Effluent[2]
	Perched Zone (SV-01)		'A' Zone (RW-01-70)[1]	'B' Zone (RW-01-95)	
	12/9/2002	12/10/2002	2/11/2002	11/13/2002	11/13/2002
Acetone	<2.0	<2.0	<500	**7.7**	**4.6**
Benzene	**13**	**5.7**	<250	<1.0	<1.3
Benzyl chloride	<2.0	<2.0	<500	<2.0	<2.5
Bromodichloromethane	<1.0	<1.0	<250	<1.0	<1.3
Bromoform	<1.0	<1.0	<250	<1.0	<1.3
Bromomethane	<1.0	<1.0	<250	<1.0	<1.3
2-Butanone	<2.0	<2.0	<500	<2.0	<2.5
Carbon disulfide	<1.0	<1.0	**960**	**2.2**	<1.3
Carbon tetrachloride	<1.0	<1.0	<250	<1.0	<1.3
Chlorobenzene	<1.0	<1.0	<250	<1.0	<1.3
Chloroethane	<1.0	<1.0	<250	<1.0	<1.3
Chloroform	<1.0	<1.0	<250	<1.0	<1.3
Chloromethane	<1.0	<1.0	<250	<1.0	<1.3
Dibromochloromethane	<1.0	<1.0	<250	<1.0	<1.3
1,2-Dibromoethane	<1.0	<1.0	<250	<1.0	<1.3
Dichlorodifluoromethane	<1.0	<1.0	<1000	<1.0	<1.3
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	<4.0	<4.0	<250	<4.0	<5.0
1,2-Dichlorobenzene	<1.0	<1.0	<250	<1.0	<1.3
1,3-Dichlorobenzene	<1.0	<1.0	<250	<1.0	<1.3
1,4-Dichlorobenzene	<1.0	<1.0	<250	<1.0	<1.3
1,1-Dichloroethane	<1.0	**16**	<250	<1.0	<1.3
1,2-Dichloroethane	**40**	<1.0	<250	<1.0	<1.3
cis-1,2-Dichloroethene	**58**	**23**	**83,000**	<1.0	<1.3
trans-1,2-Dichloroethene	**57**	<1.0	**4,800**	**14**	<1.3
1,1-Dichloroethene	<1.0	**5.7**	**3,400**	<1.0	<1.3
1,2-Dichloropropane	<1.0	<1.0	<250	<1.0	<1.3
cis-1,3-Dichloropropene	<1.0	<1.0	<250	<1.0	<1.3
trans-1,3-Dichloropropene	<2.0	<2.0	<500	<2.0	<2.5
Ethylbenzene	**37**	**100**	<250	**4.5**	**6.7**
4-Ethyltoluene	<1.0	<1.0	<250	<1.0	<1.3
2-Hexanone	<2.0	<2.0	<500	<2.0	<2.5
Hexachloro-1,3-Butadiene	<1.0	<1.0	**290**	<1.0	<1.3
Methyl tert-Butyl Ether	**19**	<4.0	<250	<4.0	<5.0
Methylene Chloride	<4.0	<4.0	<1000	<4.0	**6.4**
4-Methyl-2-pentanone	<2.0	<2.0	<500	<2.0	<2.5
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<250	<1.0	<1.3
Tetrachloroethene	**200**	**100**	**940**	<1.0	<1.3
Toluene	**10**	**17**	**870**	**3.4**	**3.0**
1,2,4-Trichlorobenzene	<2.0	<2.0	<500	<2.0	<2.5
1,1,1-Trichloroethane	**23**	**17**	<250	<1.0	<1.3
1,1,2-Trichloroethane	<1.0	<1.0	<250	<1.0	<1.3
Trichloroethene	**18**	**8.8**	**190,000**	**89**	<1.3
Trichlorofluoromethane	<1.0	<1.0	<250	<1.0	<1.3
1,1,2-Trichloro-1,2,2-Trifluoroethane	<2.0	<2.0	<500	<2.0	<2.5
1,2,4-Trimethylbenzene	**3.2**	**6.5**	<500	<2.0	<2.5
Styrene	<2.0	<2.0	<500	<2.0	<2.5
Vinyl acetate	<2.0	<2.0	<500	<2.0	<2.5
Vinyl chloride	<1.0	**16**	**29,000**	<1.0	<1.3
m.p-Xylene	**21**	**140**	<500	**22**	**34**
o-Xylene	**6.6**	**46**	<250	**6.7**	**11**

Notes:
All units in parts per billion (ppb).
Concentrations preceded by < were below the given reporting limits.
Samples analyzed by Calscience Environmental Laboratories using EPA Method TO-15.

1. Dillution Factor (DF) = 500 for all results of RW-01-70, with exception to cis-1,2-dichloroethene and vinyl chloride (DF = 5,000), and trichloroethene (DF = 20,000).
2. Methylene chloride was not detected in any influent vapor samples. Likewise, effluent concentrations of ethylbenzene and total xylenes were higher than those concentrations detected in influent samples. These elevated concentrations are likely the result of laboratory cross contamination.

Table 3
Drawdown Versus Distance During HVDPE Tests
Pemaco Superfund Site, Maywood, California

Well ID	Distance (feet)	Depth to Water (Pre-Pumping) (feet bgs)	Total Depth of Well (feet bgs)	Water Column (Pre-Pumping) (feet)	Δ GW During Drop-Tube Test (feet)	Δ GW During Submersible Pump Test (feet)
SV-01	0.00	30.02	34.68	4.66	-4.66	--
B-01	54.00	31.56	34.90	3.34	- 0.61	--
B-03	27.00	30.30	38.32	8.02	- 0.61	--
B-04	29.00	28.62	35.89	7.27	- 1.3	--
B-05	22.00	29.60	36.20	6.60	- 2.3	--
OB-1W	10.00	30.17	34.71	4.54	- 4.32	--
OB-1V	0.00	9.87	19.79	9.92	- 4.32	--
RW-01-70	0.00	63.45	69.38	5.93	--	--
MW-14-80	104.00	--	--	--	-0.52	-0.51
MW-15-70	13.00	64.25	69.13	4.88	-2.46	-2.00
MW-16-70	10.00	62.63	68.37	5.74	-3.09	-2.45
MW-17-70	19.00	64.25	68.58	4.33	-1.80	-1.78
MW-18-70	22.00	61.20	66.95	5.75	-1.00	-0.93
MW-19-70	38.00	61.32	69.55	8.23	-0.98	-0.96
RW-01-95	0.00	67.62	94.20	26.58	--	--
MW-15-85	18.50	68.48	85.90	17.42	--	-5.77
MW-16-90	10.50	66.60	89.10	22.50	--	-7.51
MW-17-85	0.00	67.40	81.11	13.71	--	0.00
MW-17-95	0.00	84.25	93.35	9.10	--	0.00
MW-18-85	16.00	65.15	85.35	20.20	--	-5.54
MW-19-90	31.30	65.19	88.28	23.09	--	-4.00

Notes:

bgs = below ground surface (as measured from the top of casing)

Pre-pumping water levels measured on December 9, 2002

-- = not applicable/not available.

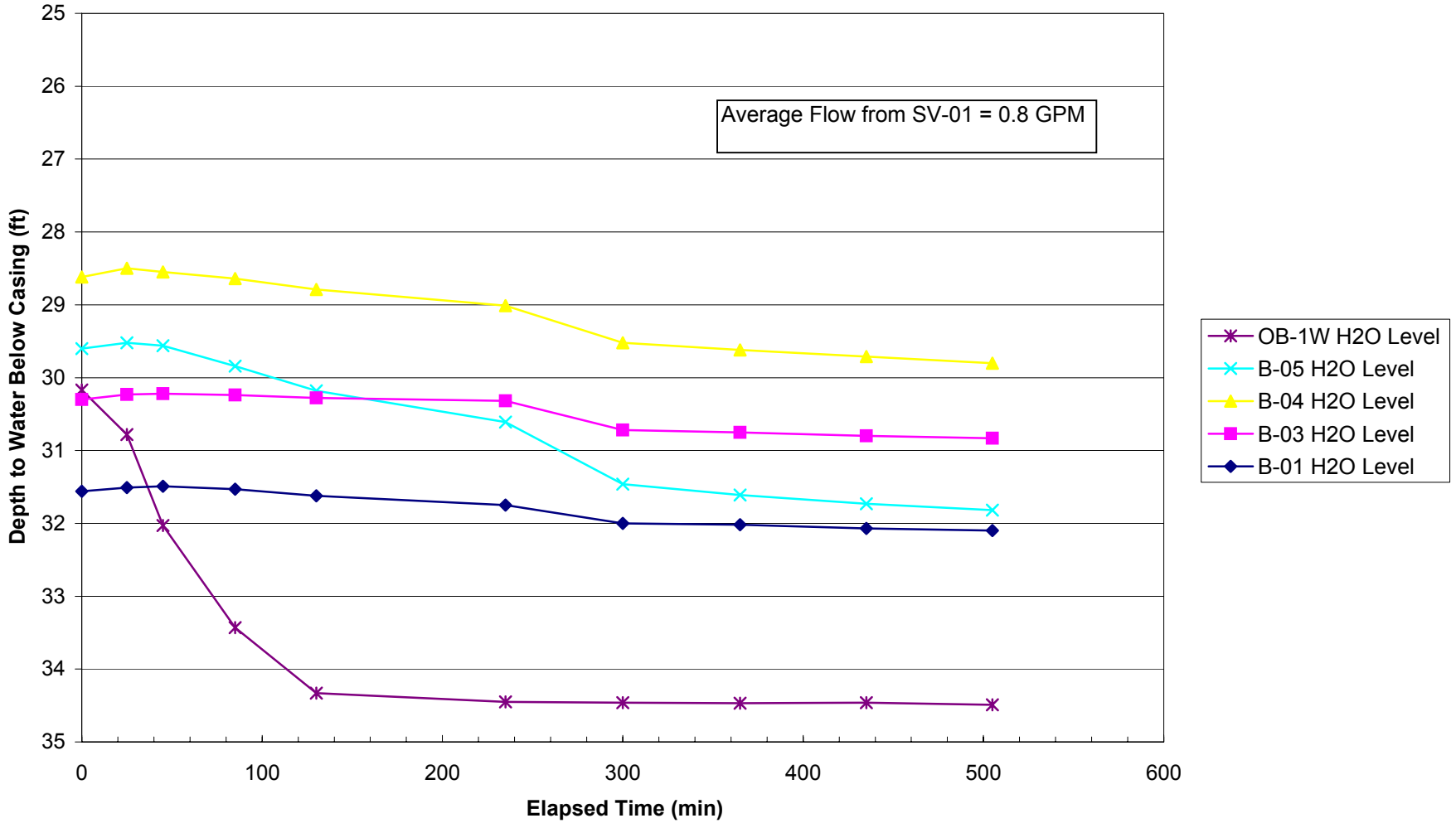
Table 4
Summary of HVDPE Test Data
Pemaco Superfund Site, Maywood, California

Ground-water Zone	Extraction Well	Screen Interval (feet)	Screen Length (feet)	Diameter (inches)	Sustained Wellhead Vacuum		Sustained Blower Vacuum		Sustained Liquid Flow Rate		Sustained Vapor Flow Rate		Average Influent PID Readings		Effective Vapor Radius of Influence (at 0.5" H2O)		Estimated Groundwater Radius of Influence		Comments
					Drop Tube	Down-Hole Pump	Drop Tube	Down-Hole Pump	Drop Tube	Down-Hole Pump	Drop Tube	Down-Hole Pump	Drop Tube	Down-Hole Pump	Drop Tube	Down-Hole Pump	Drop Tube	Down-Hole Pump	
					inches Hg	inches Hg	inches Hg	inches Hg	gpm	gpm	cfm	cfm	ppm/v	ppm/v	feet	feet	feet	feet	
Perched	SV-01	10 - 35	25	4	14	--	21	--	0.8	--	65	--	30	--	54	--	72	--	Low PID readings likely due to previous remediation efforts using SVE.
'A'	RW-01-70	55 - 70	15	6	15	20.5	23	23	1.1	0.4	--	81	850	800	37	37	175	175	Increased flow with vacuum assist due to absence of pump enabling additional 2.8 feet of drawdown.
'B'	RW-01-95	80 - 95	15	6	--	25	--	26.5	--	2.0	--	13	--	10	--	0	--	69	Introduction of vacuum to this zone only increases liquid flow rate and does not effectively remove vapor concentrations due to confined conditions.

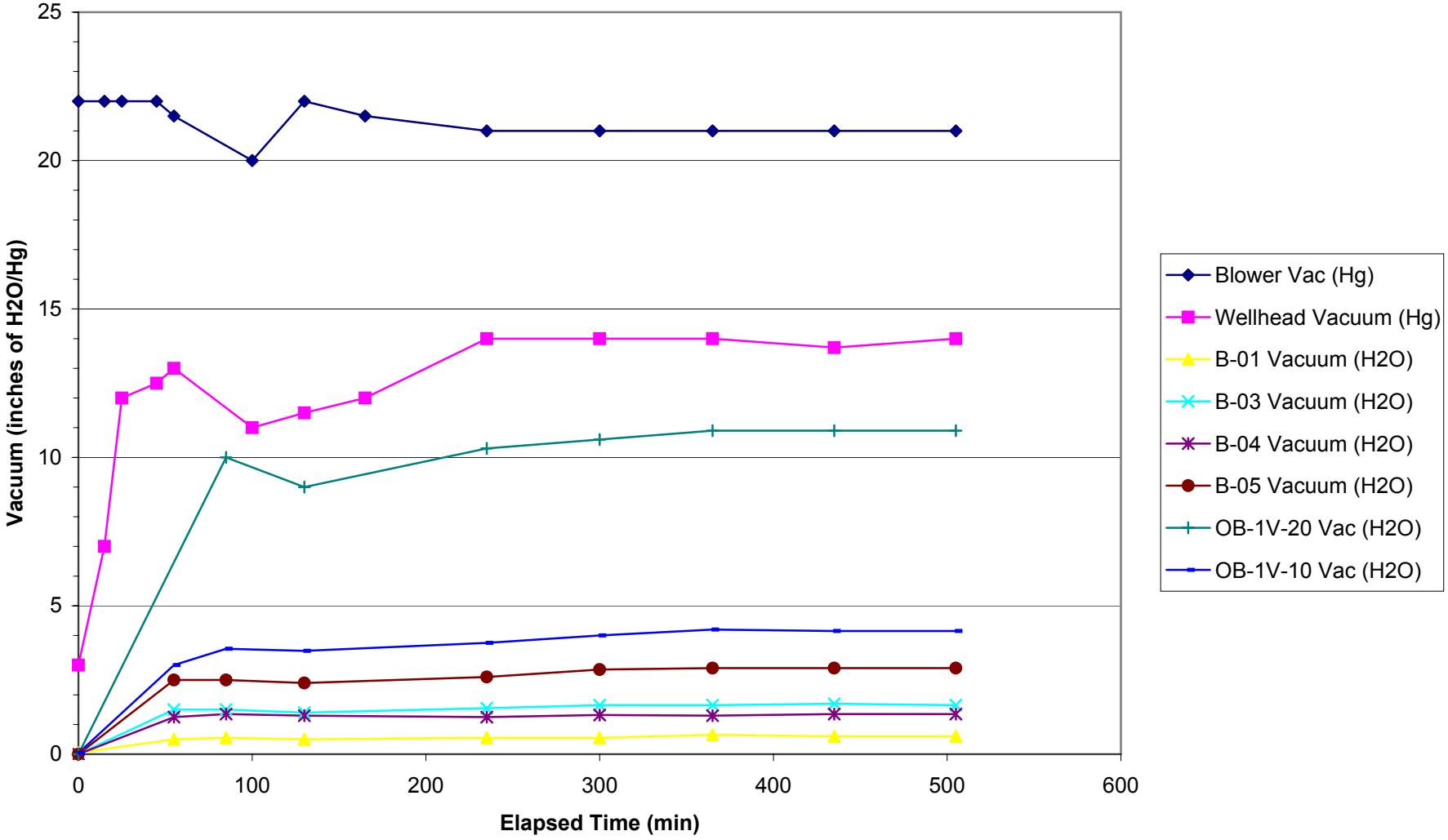
Notes:
inches Hg = inches of mercury
gpm = gallons per minute
cfm = cubic feet per minute
ppm/v = parts per million per volume

GRAPHS

Graph 1A - HVDPE Water Level Data, Perched Zone
Pemaco Superfund Site, Maywood, California

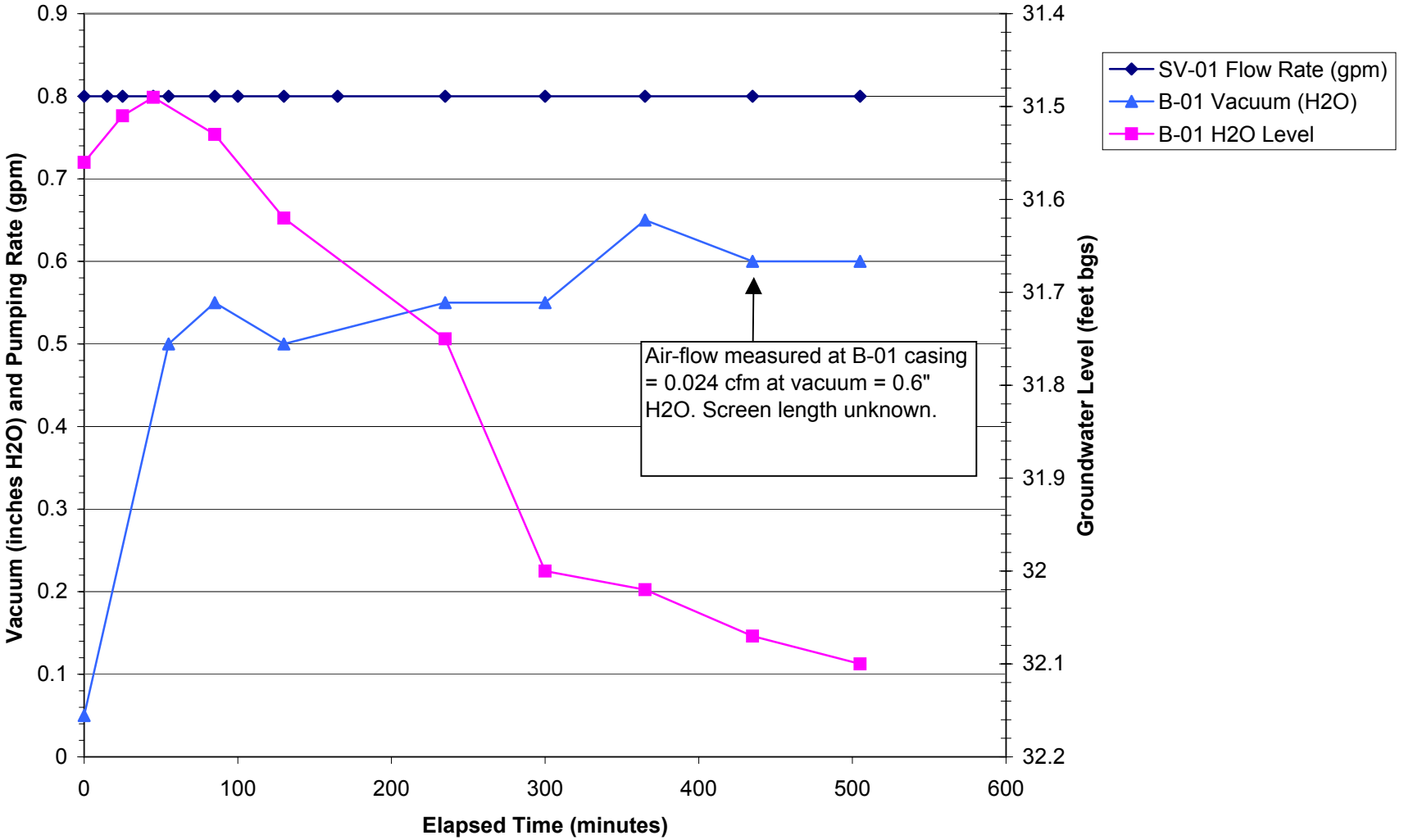


Graph 1B - HVDPE Vacuum Data, Perched Zone
Pemaco Superfund Site, Maywood, California



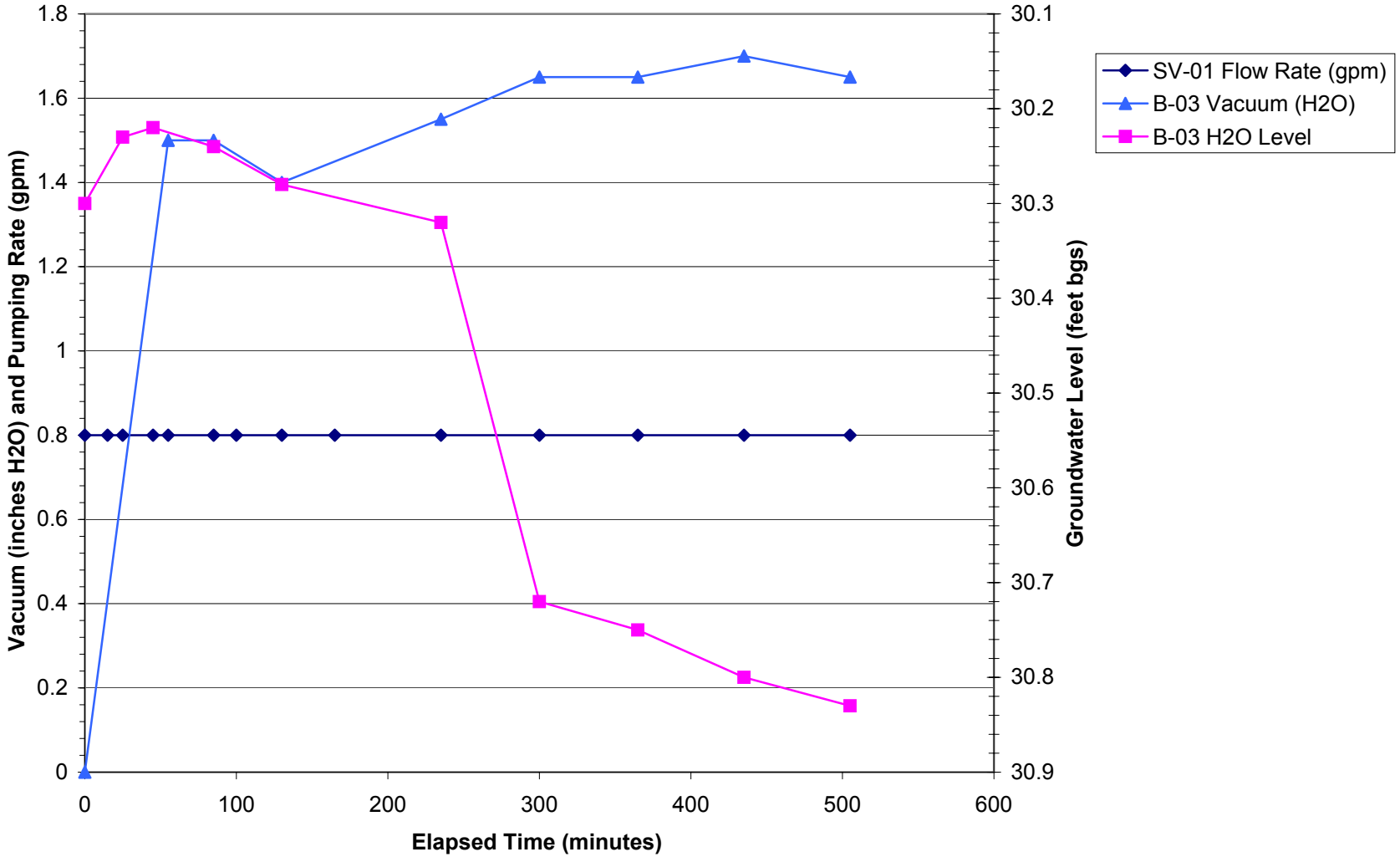
Graph 2A - Observation Well B-01 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



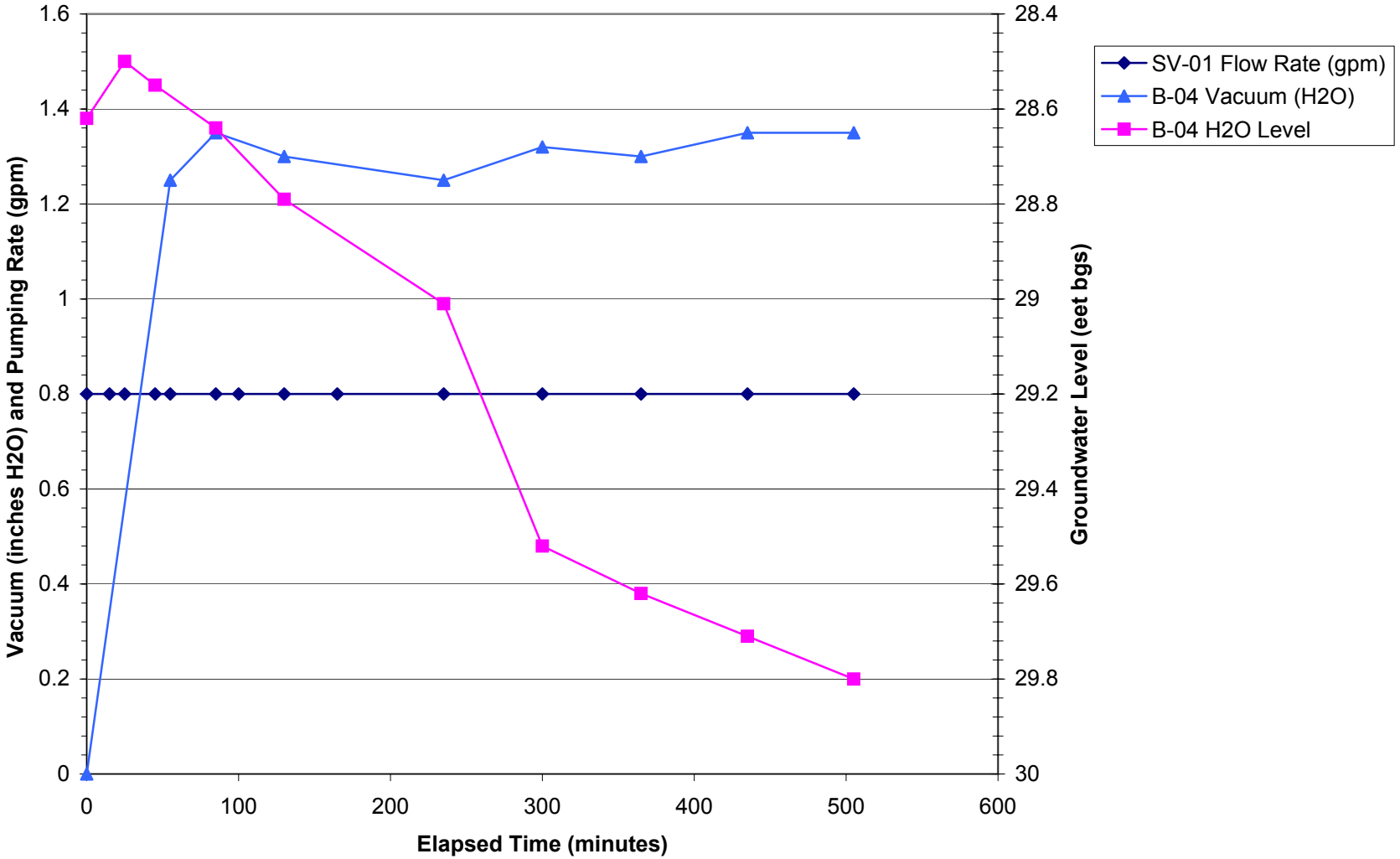
Graph 2B - Observation Well B-03 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



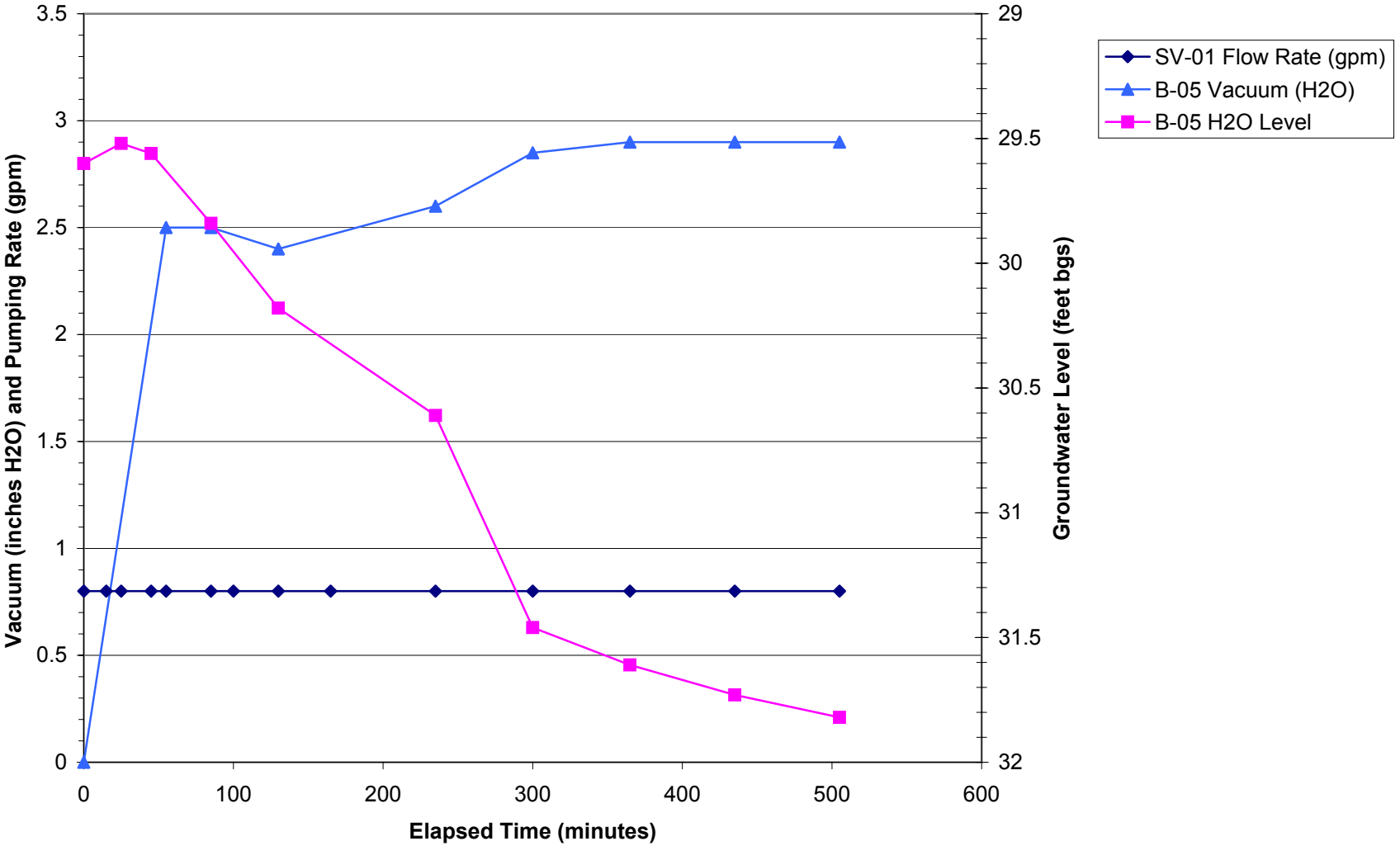
Graph 2C - Observation Well B-04 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



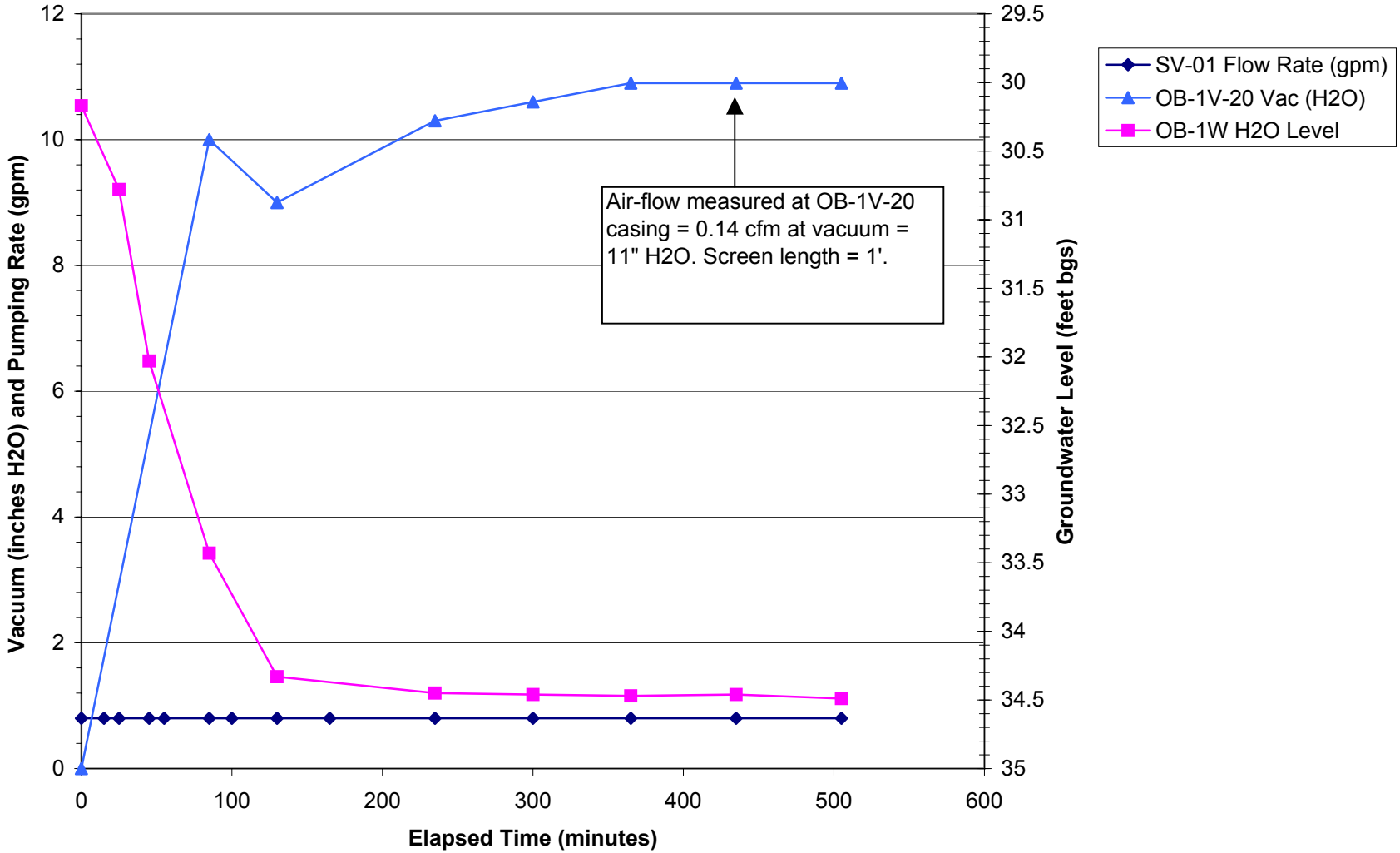
Graph 2D - Observation Well B-05 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



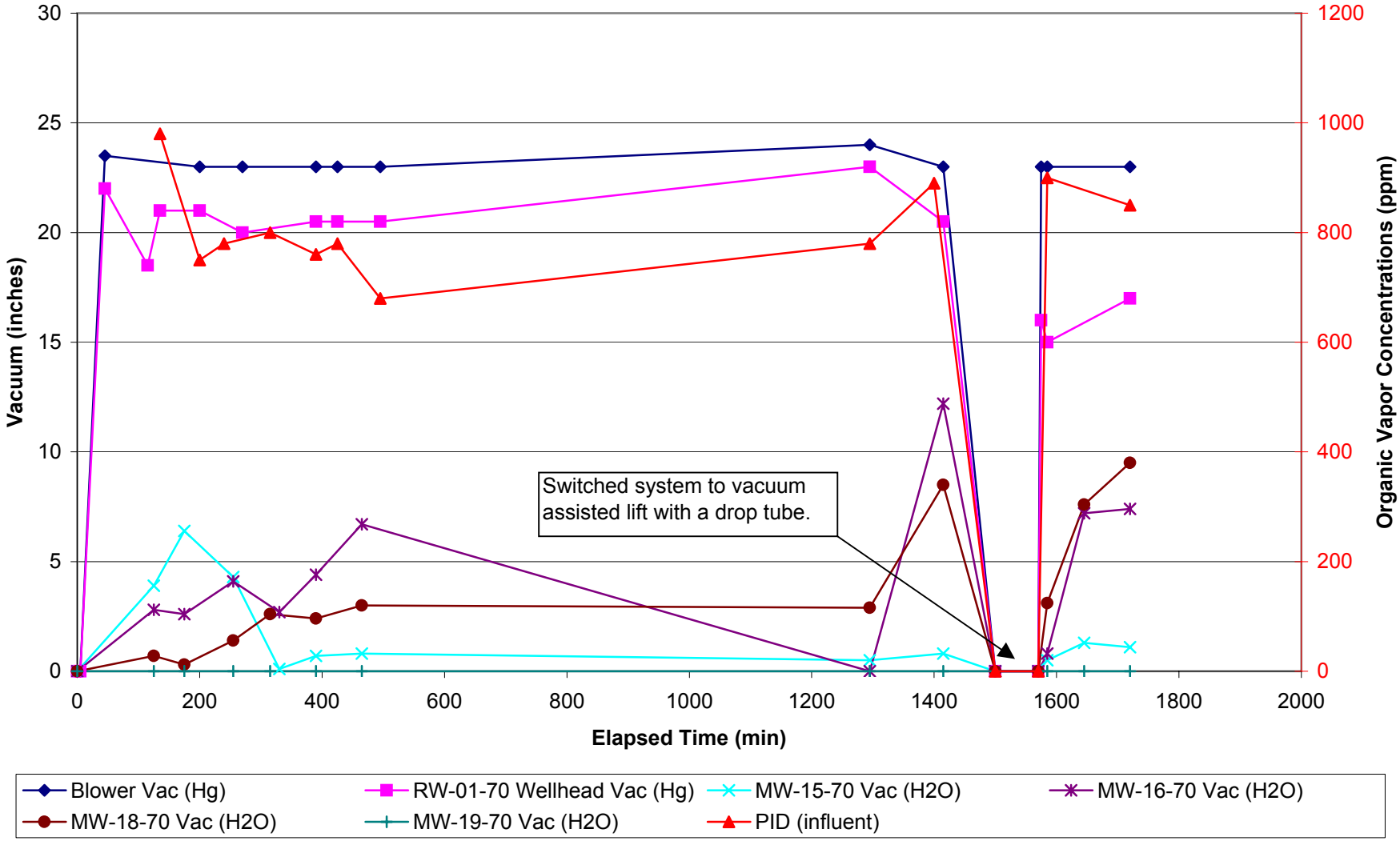
Graph 2E - OB-1V-20 Vacuum nad OB-1W Water Level vs. Time

Pemaco Superfund Site, Maywood, California



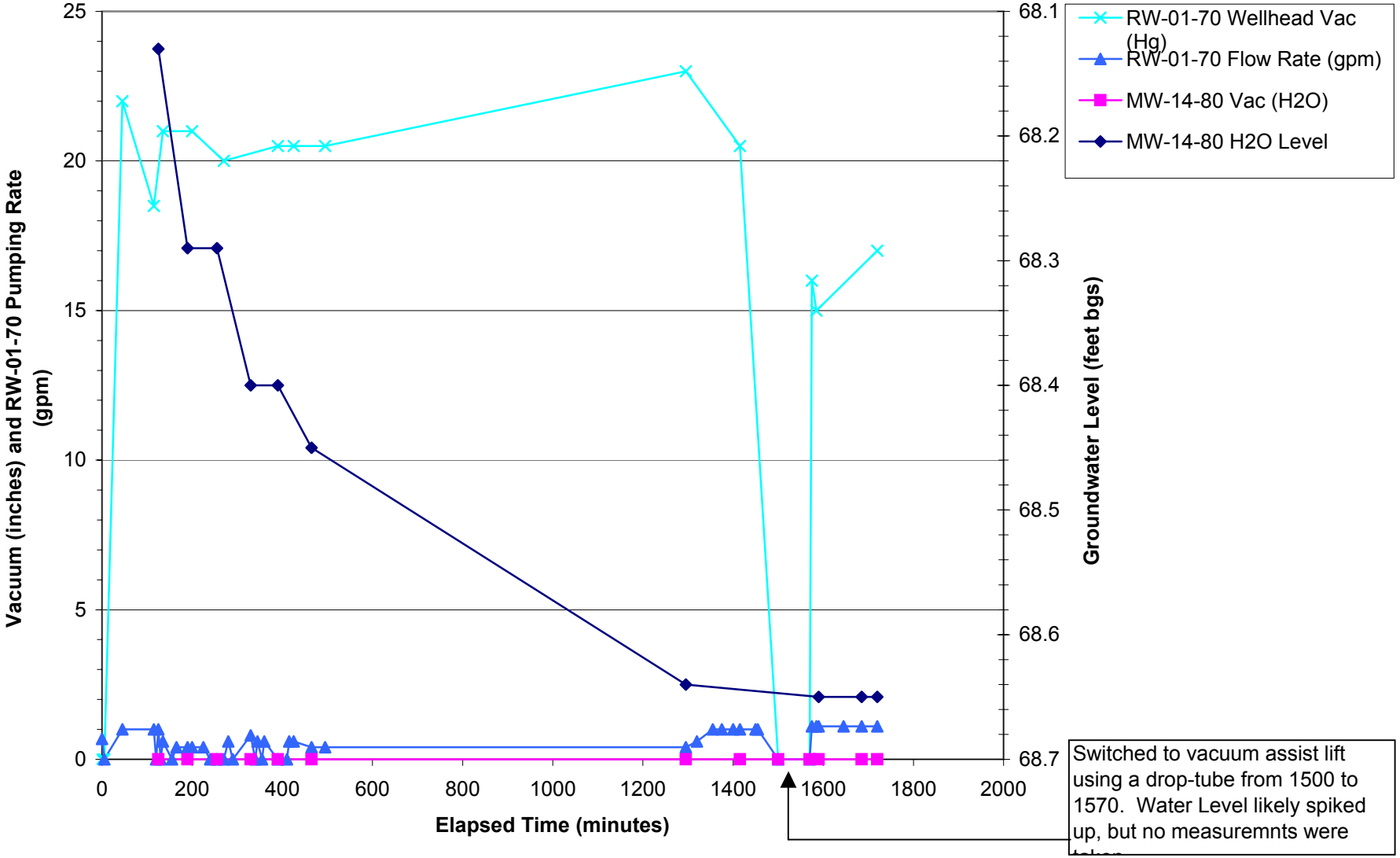
Graph 3 - HVDPE Vacuum and Influent Levels - 'A' Zone

Pemaco Superfund Site, Maywood, California



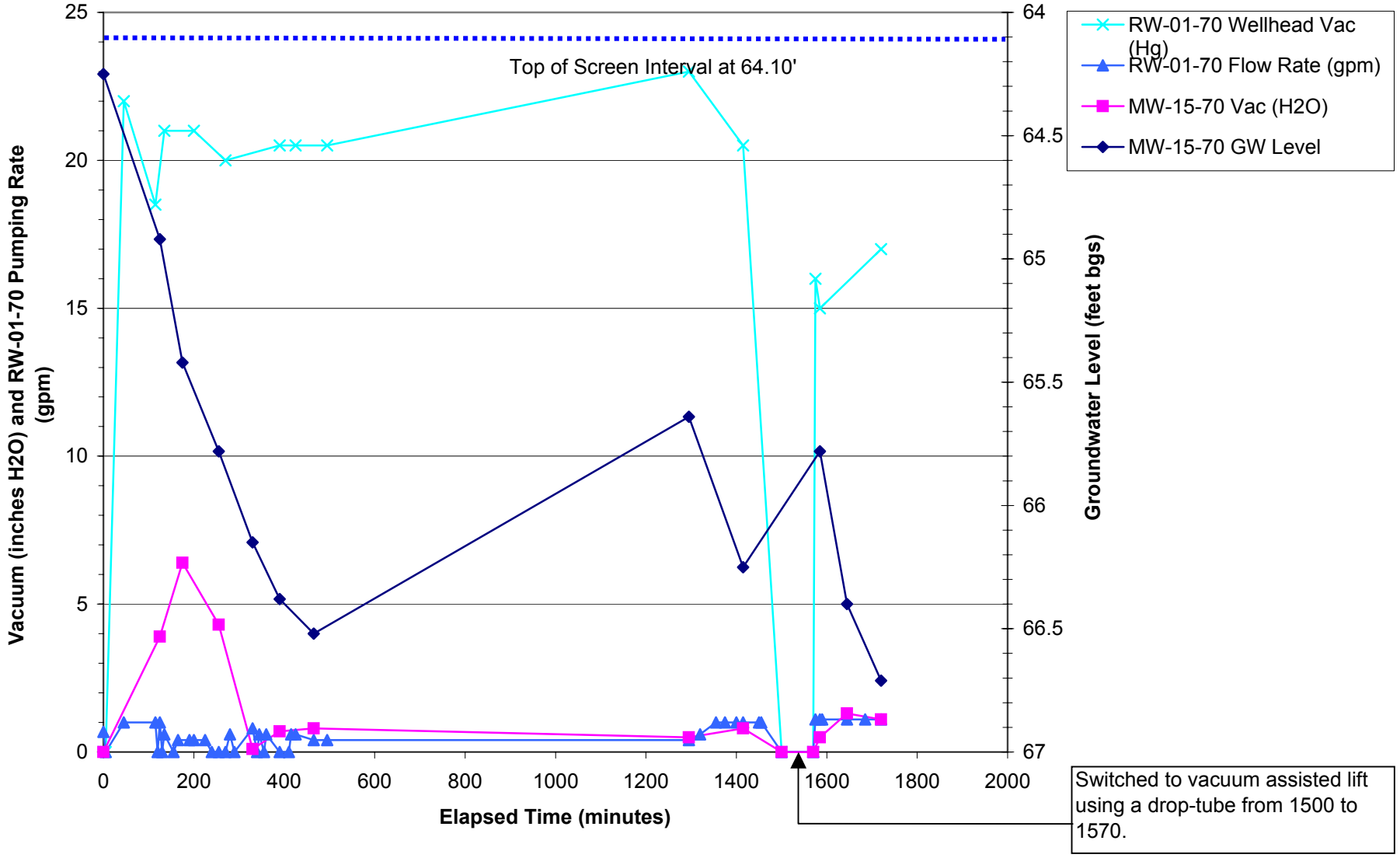
Graph 4A - Observation Well MW-14-80 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



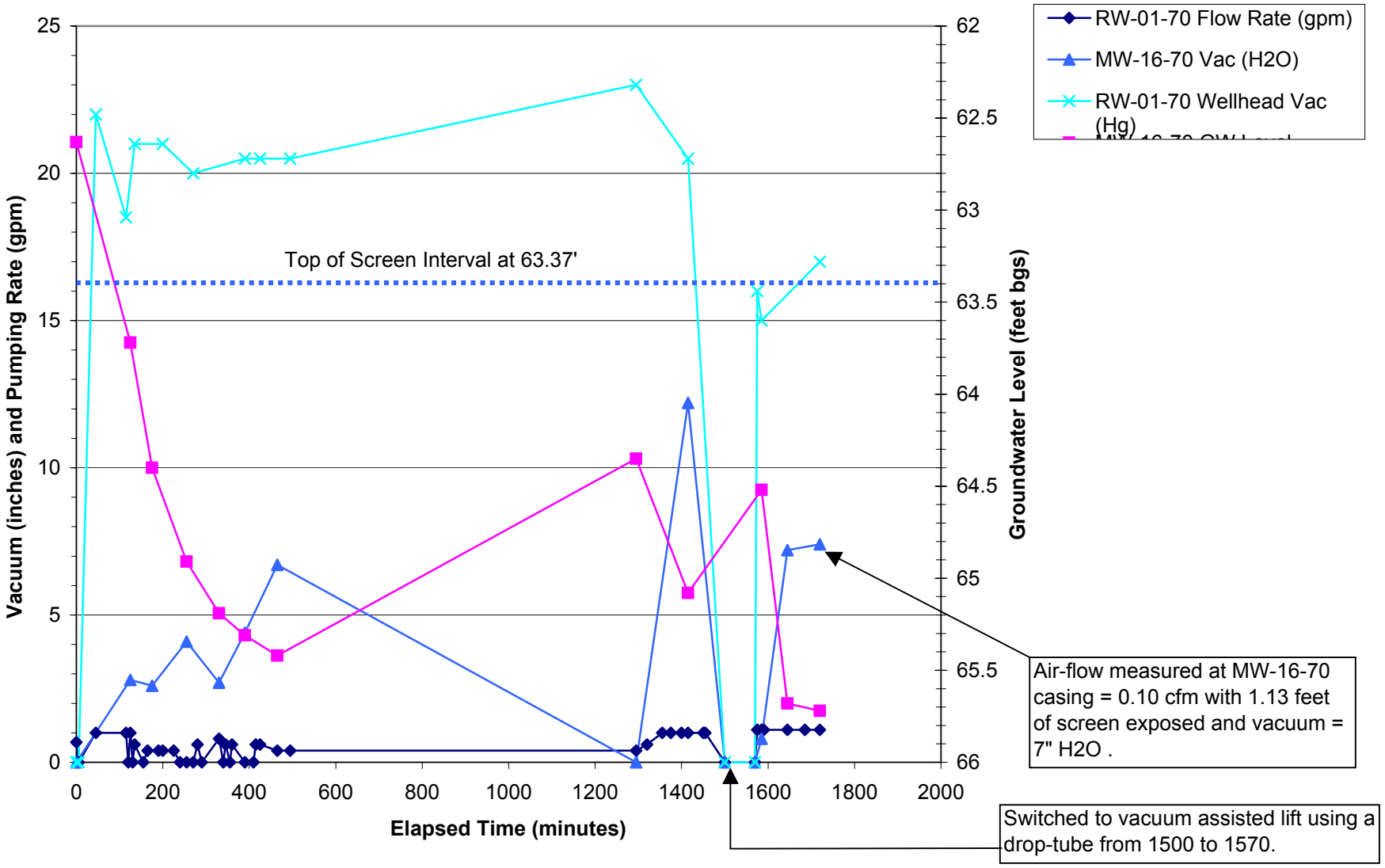
Graph 4B - Observation Well MW-15-70 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



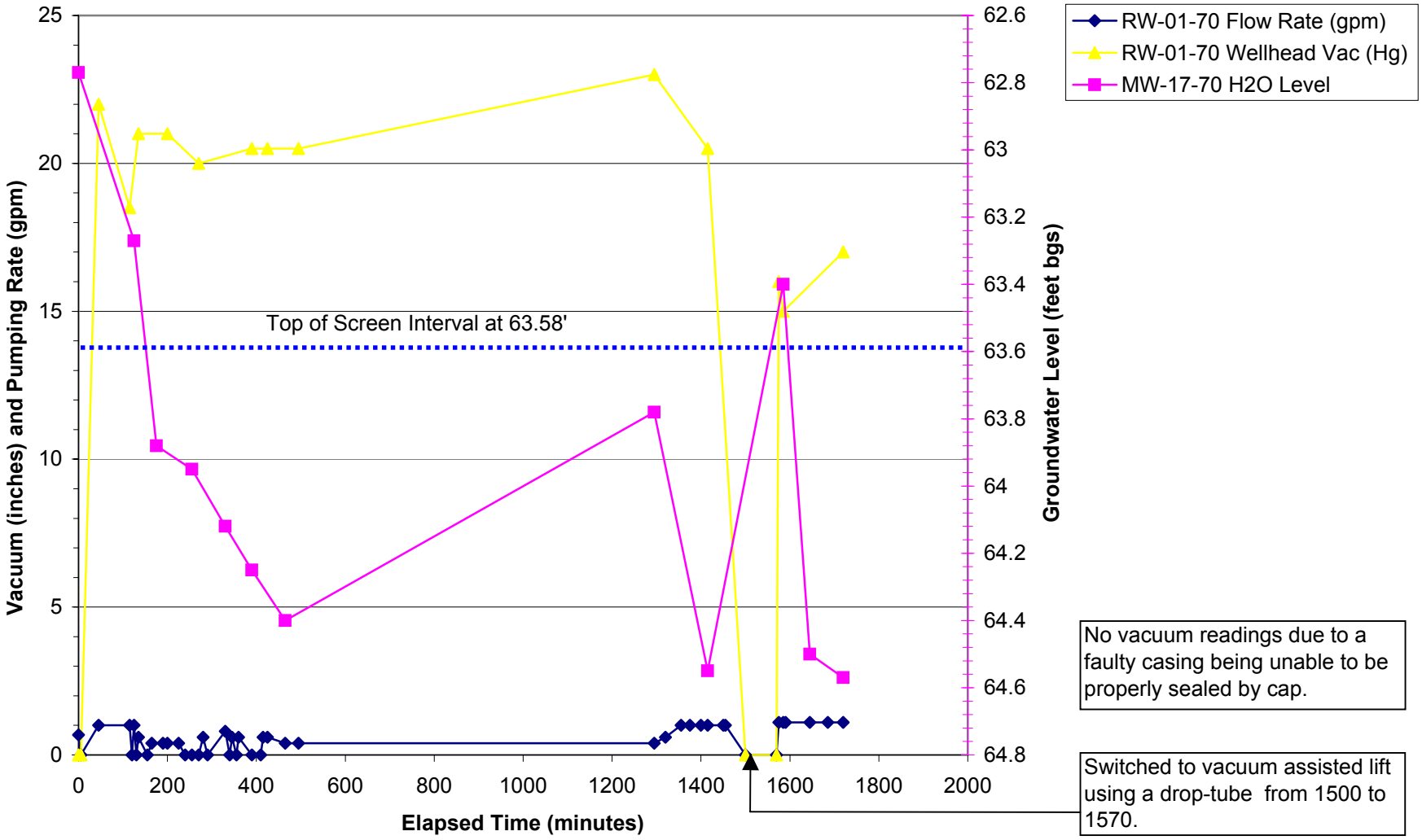
Graph 4C - Observation Well MW-16-70 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



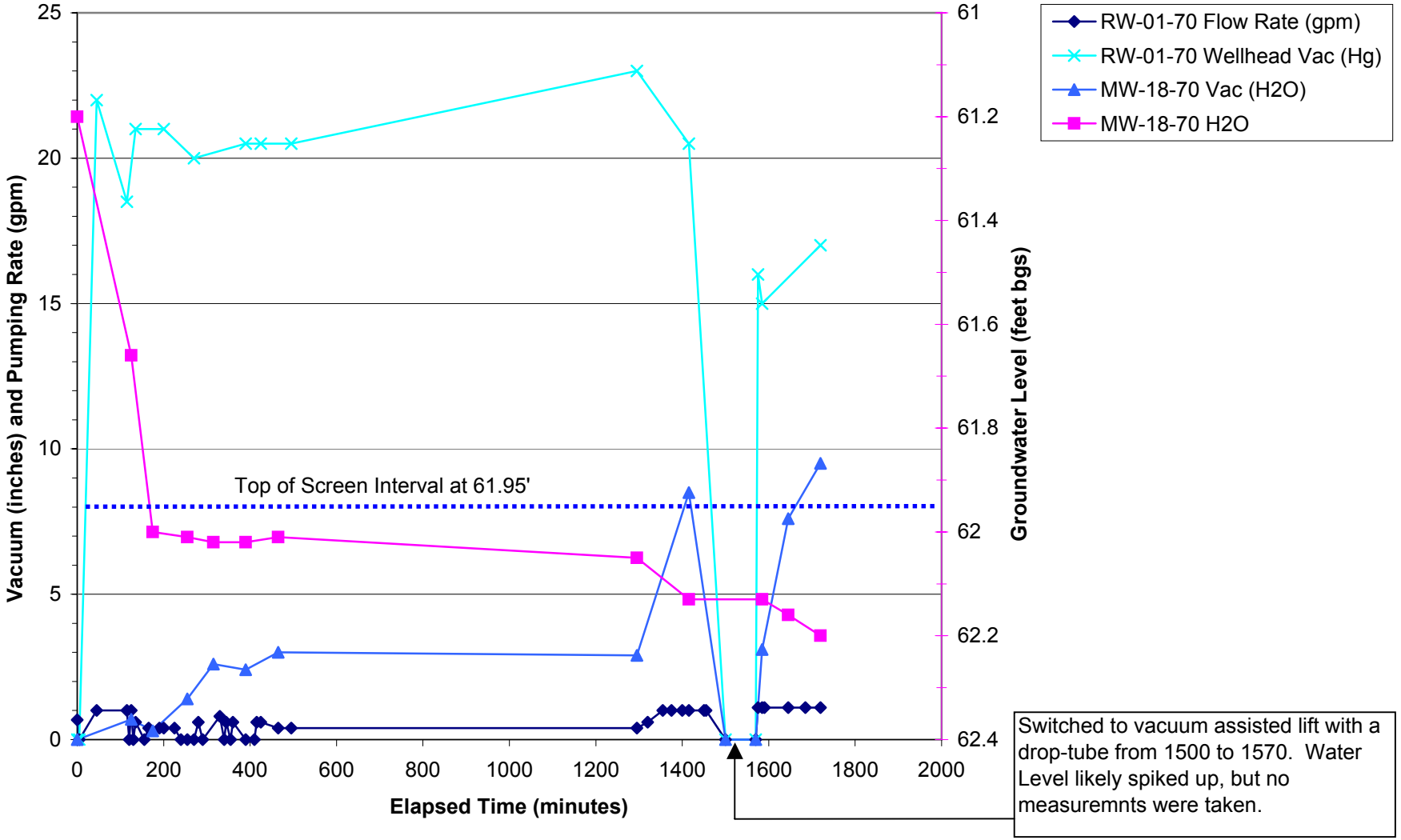
Graph 4D - Observation Well MW-17-70 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



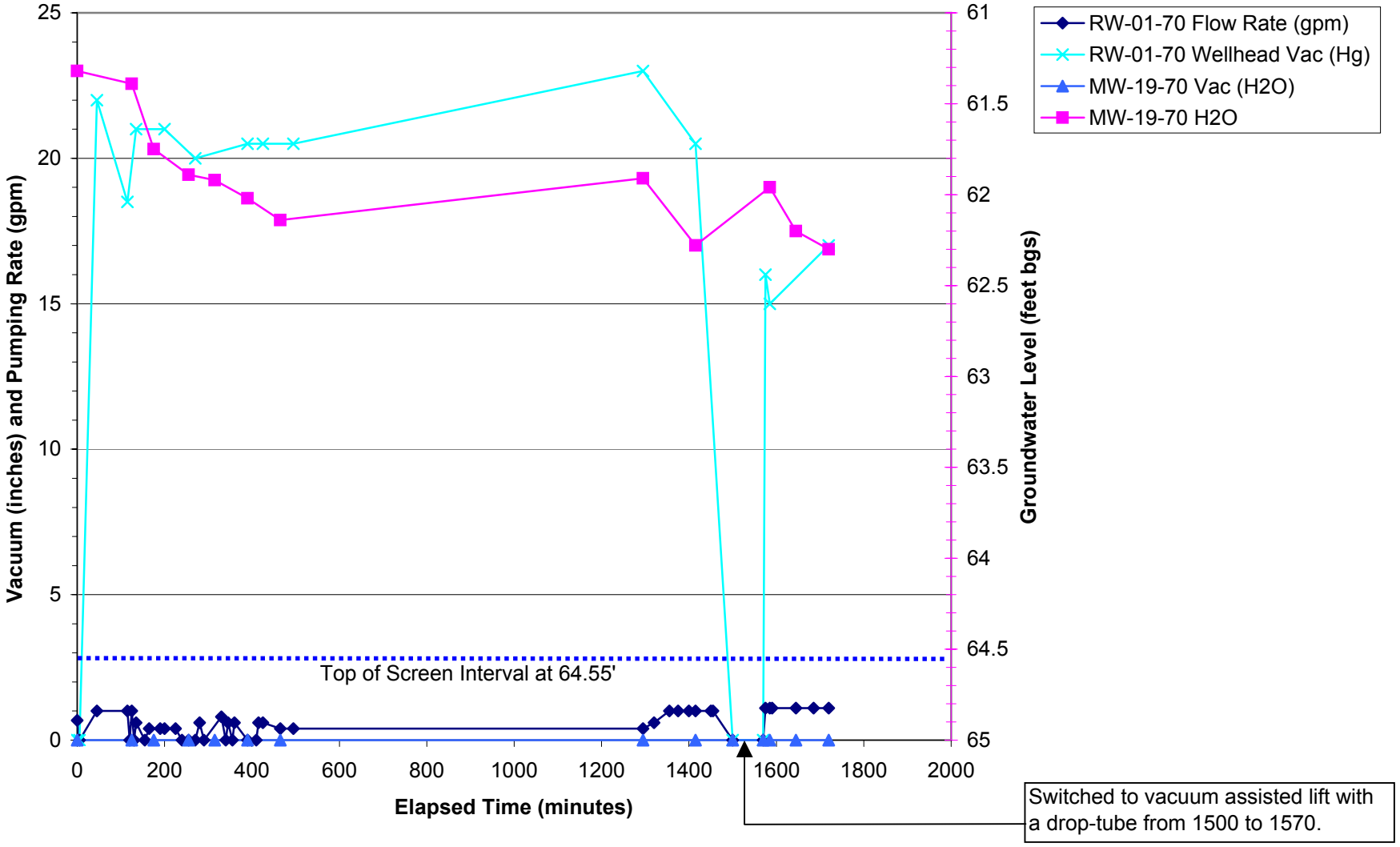
Graph 4E - Observation Well MW-18-70 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



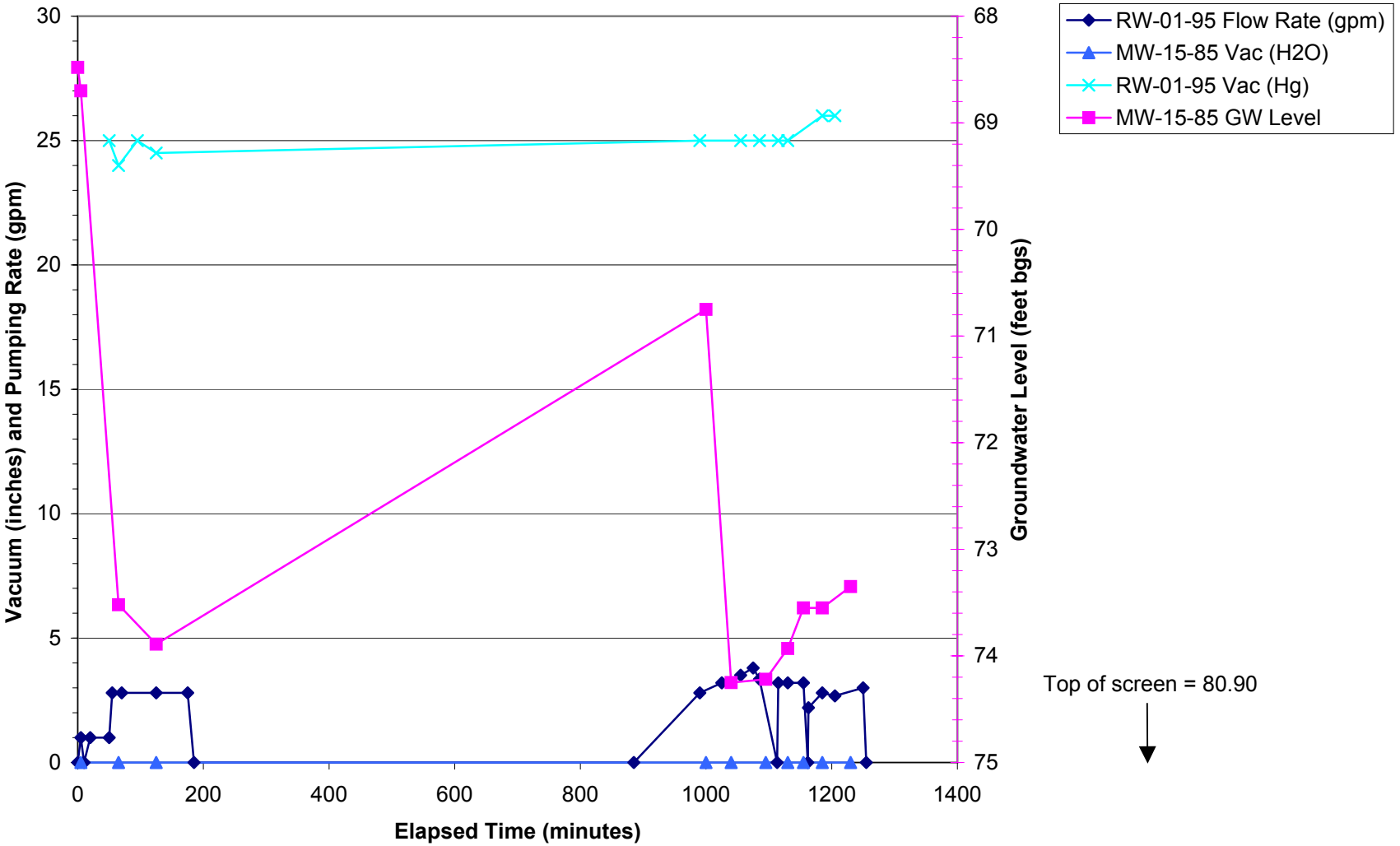
Graph 4F - Observation Well MW-19-70 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



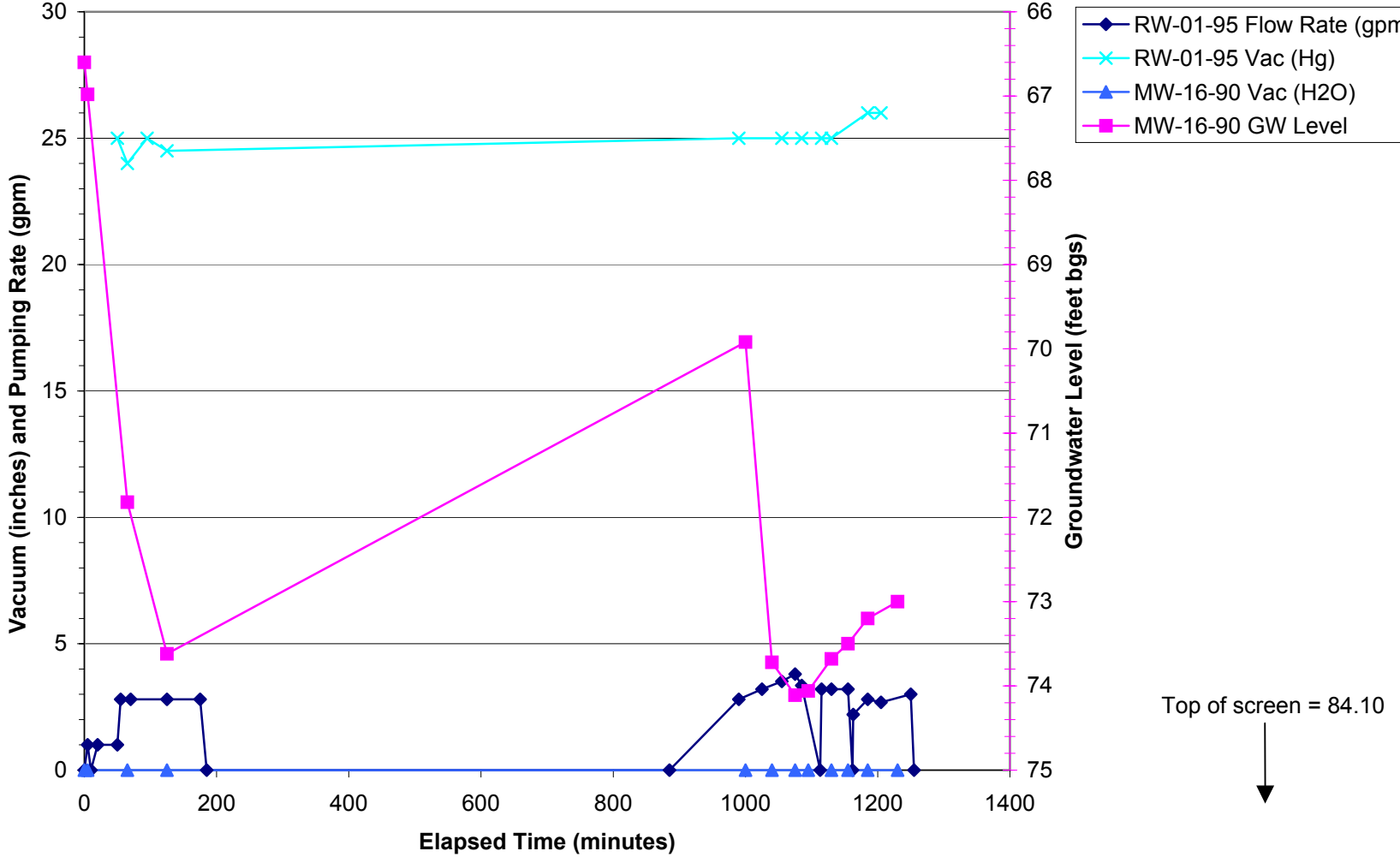
Graph 5A - Observation Well MW-15-85 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



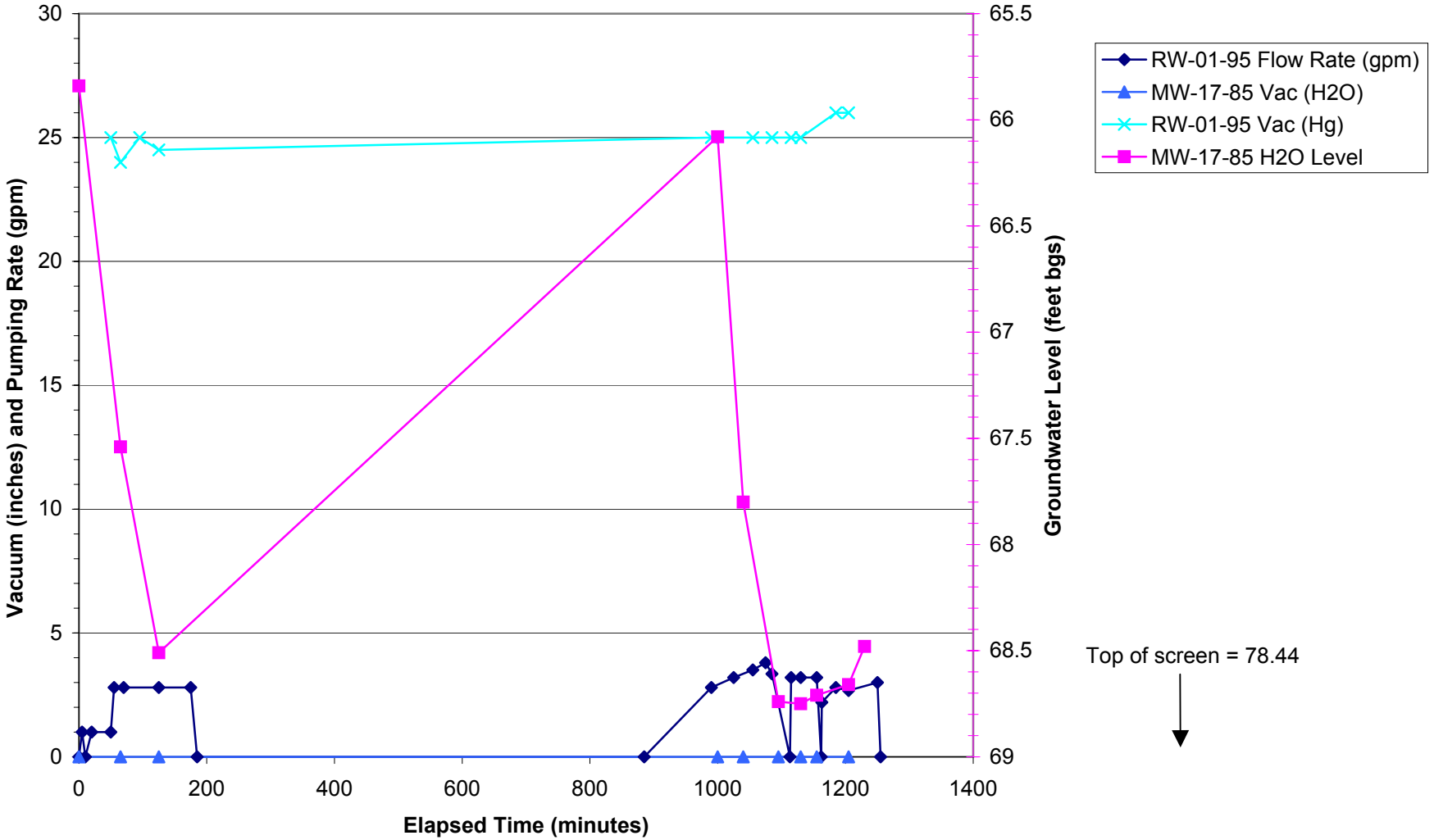
Graph 5B - Observation Well MW-16-90 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



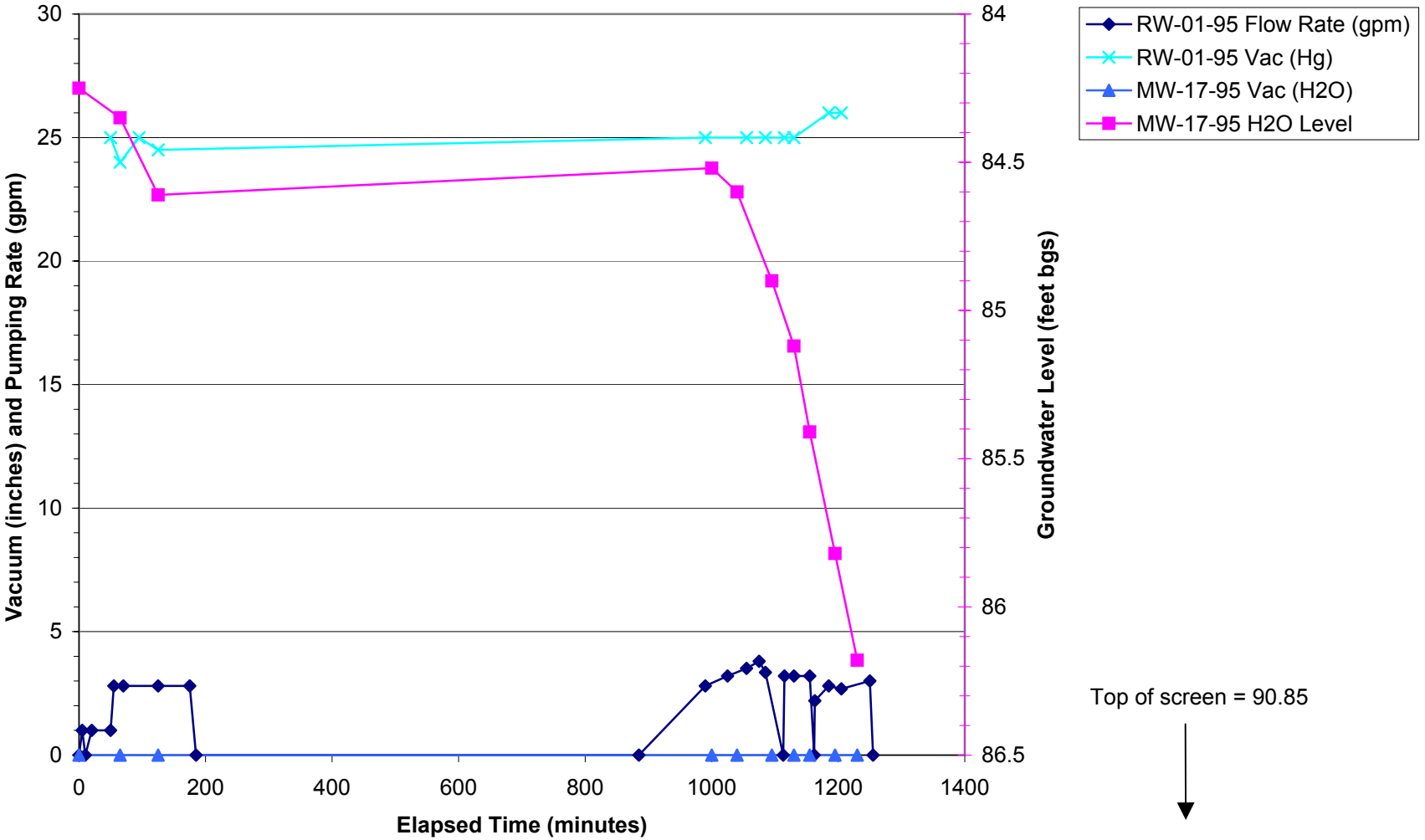
Graph 5C - Observation Well MW-17-85 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



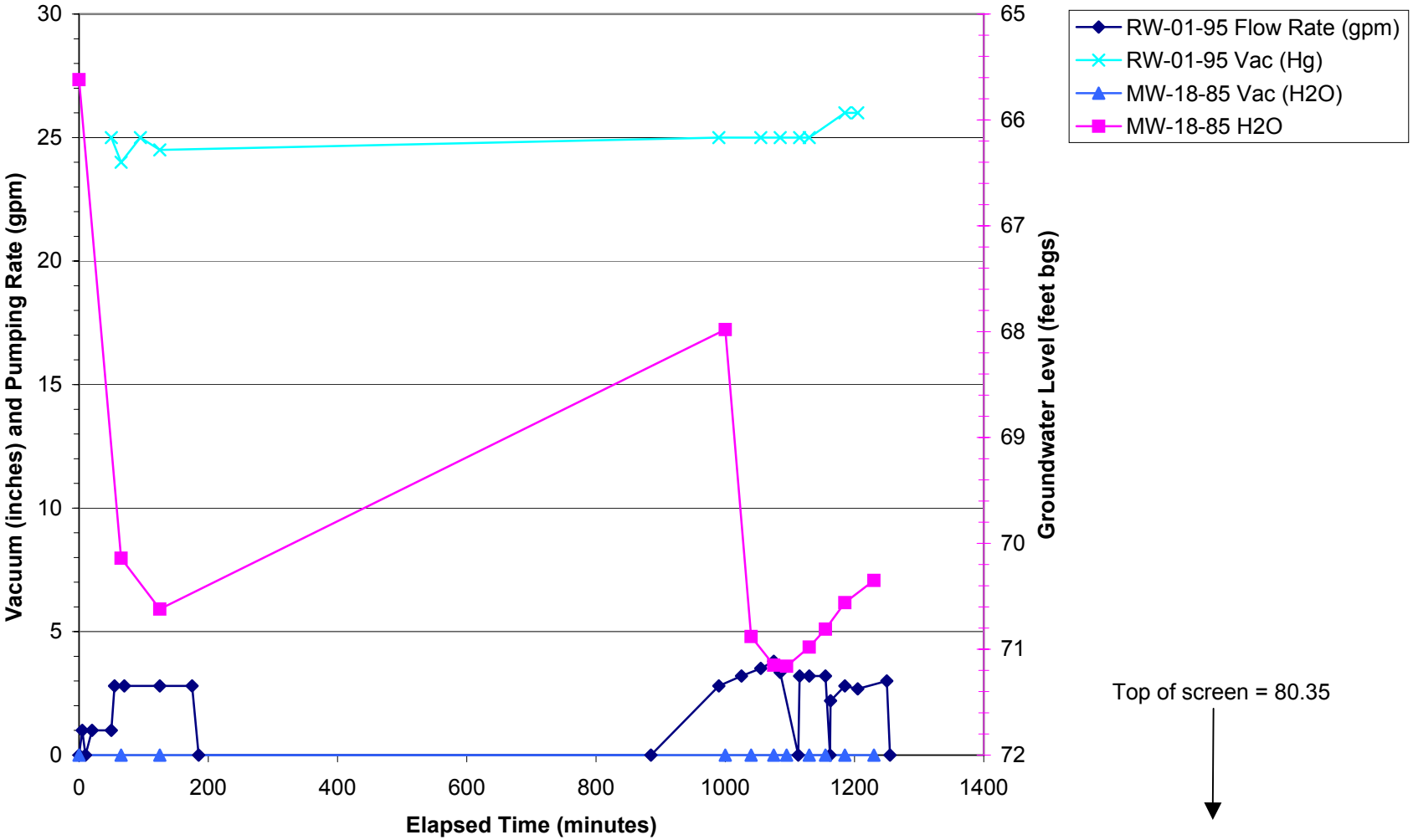
Graph 5D - Observation Well MW-17-95 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California



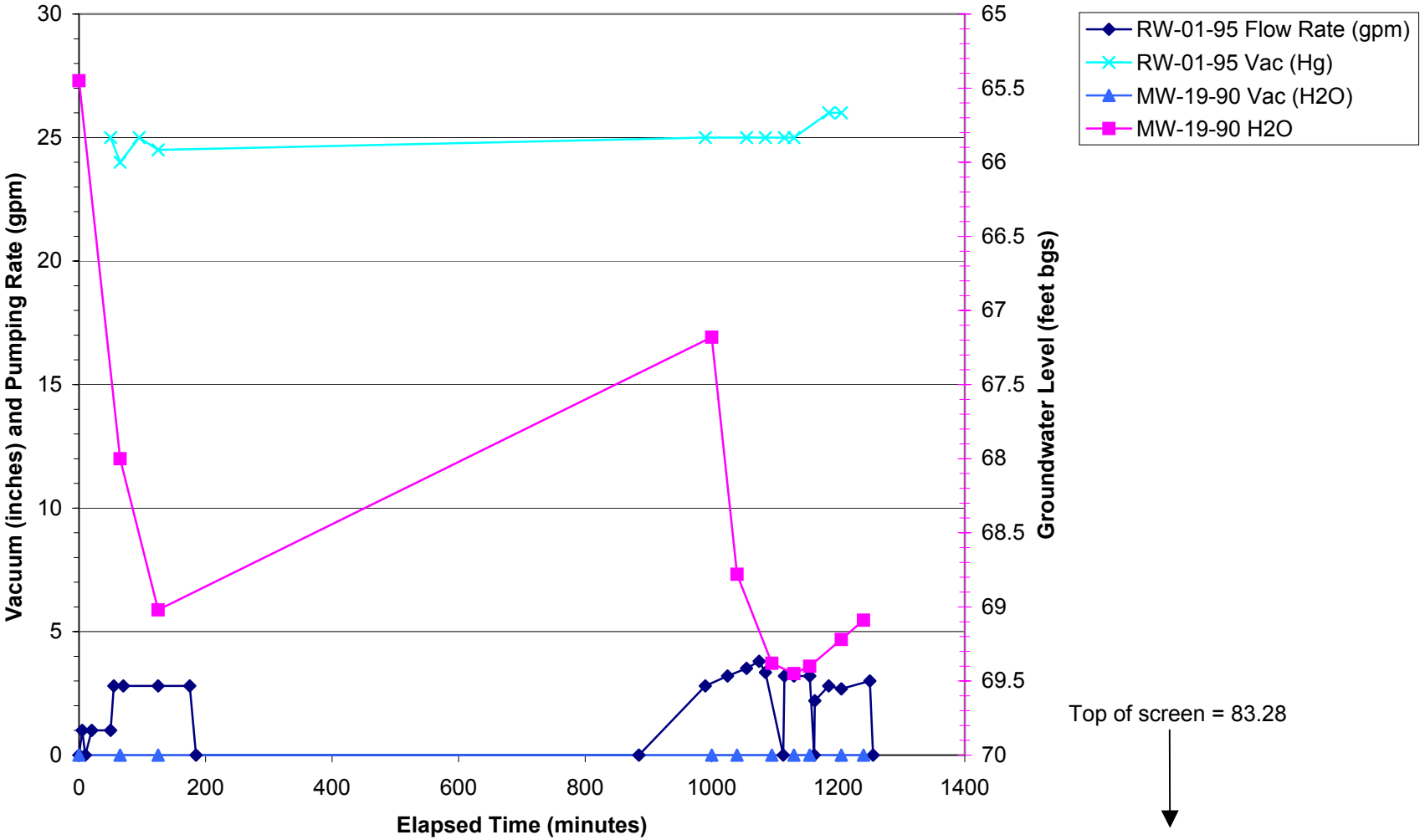
Graph 5E - Observation Well MW-18-85 Vacuum and Water Level vs. Time

Pemaco Superfund Site, Maywood, California

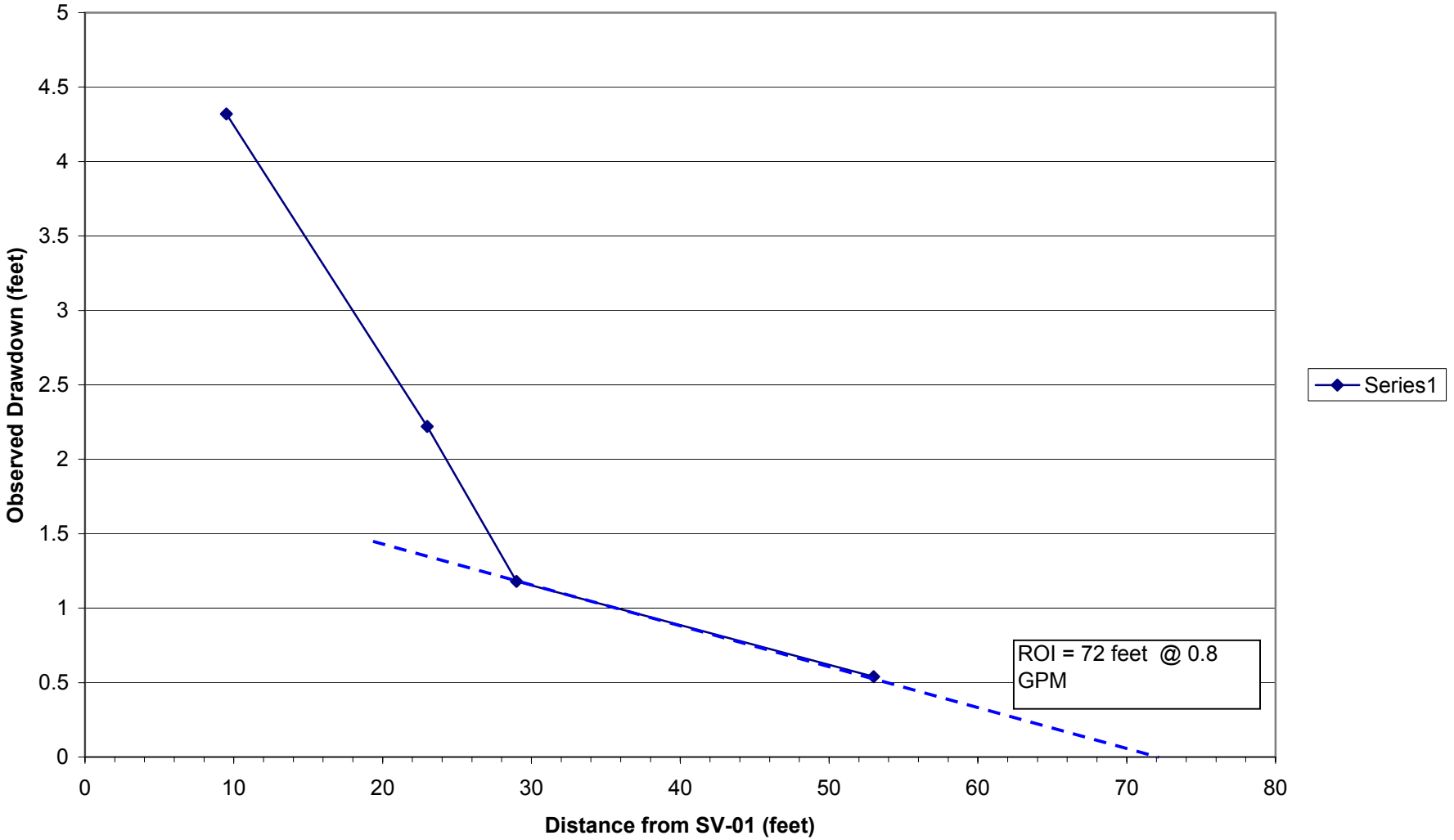


Graph 5F - Observation Well MW-19-90 Vacuum and Water Level vs. Time

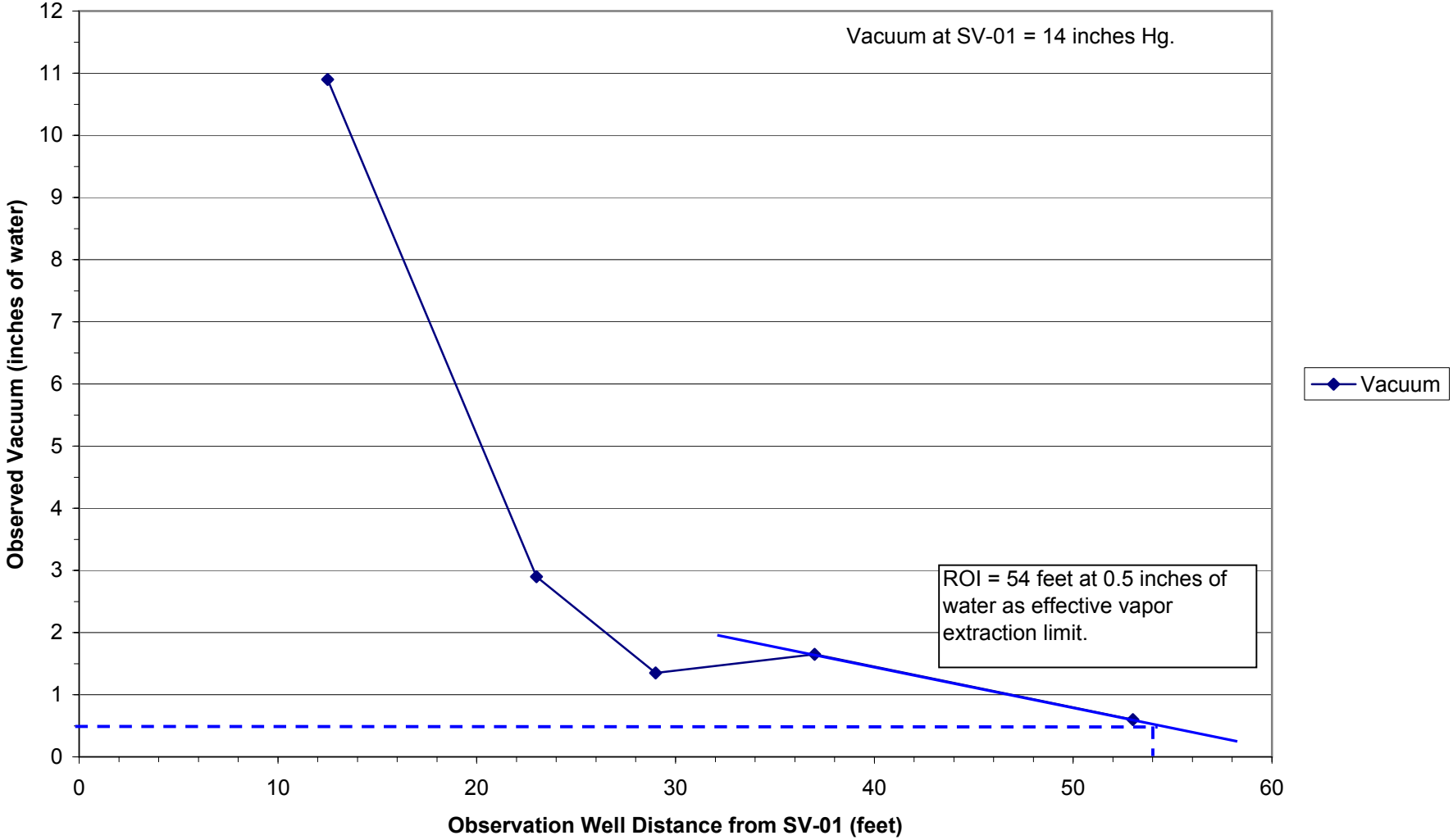
Pemaco Superfund Site, Maywood, California



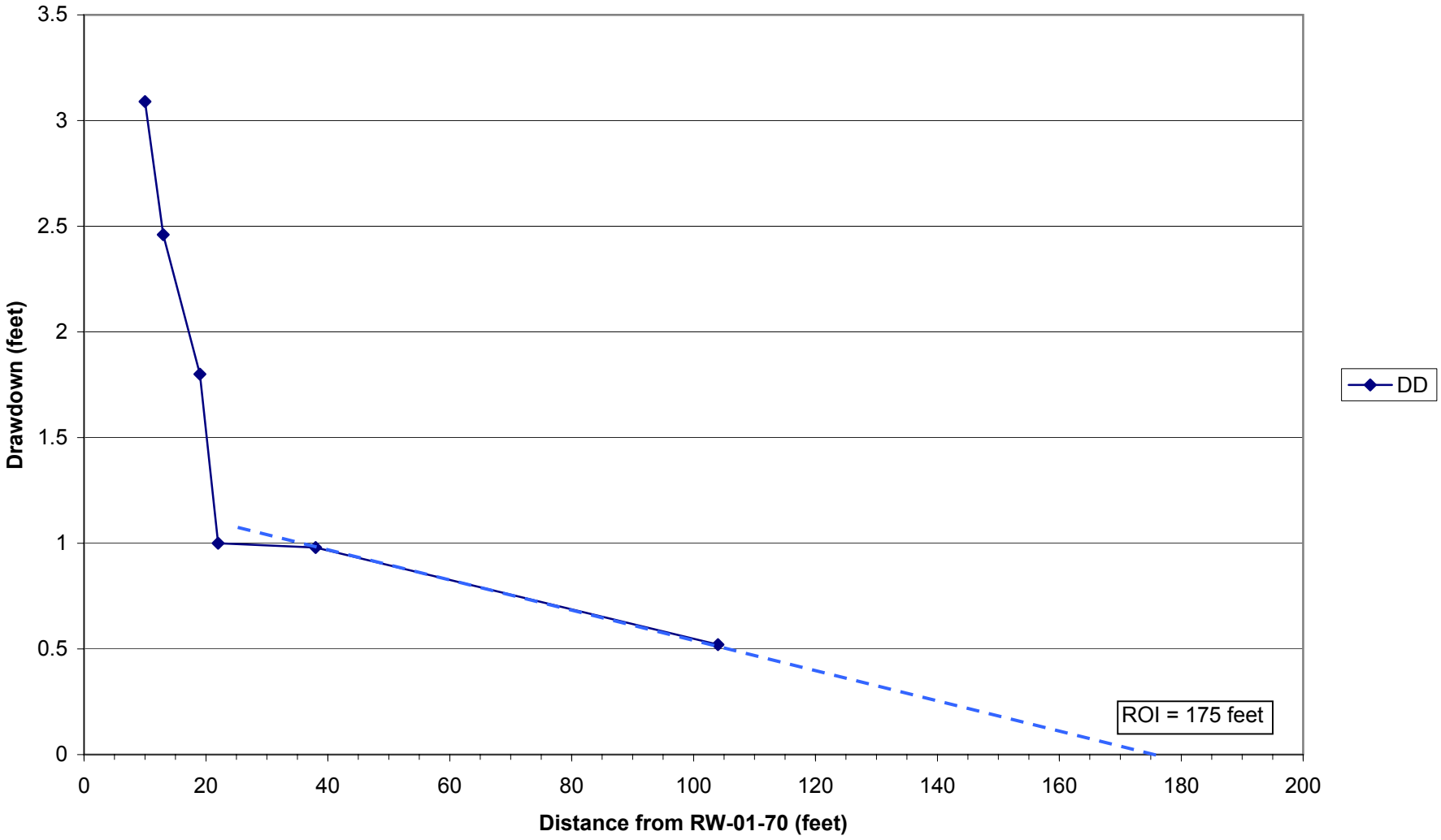
Graph 6A - HVDPE Distance vs. Drawdown, Perched Zone
Pemaco Superfund Site, Maywood, California



Graph 6B - Distance from SV-01 vs. Vacuum
Pemaco Superfund Site, Maywood, California

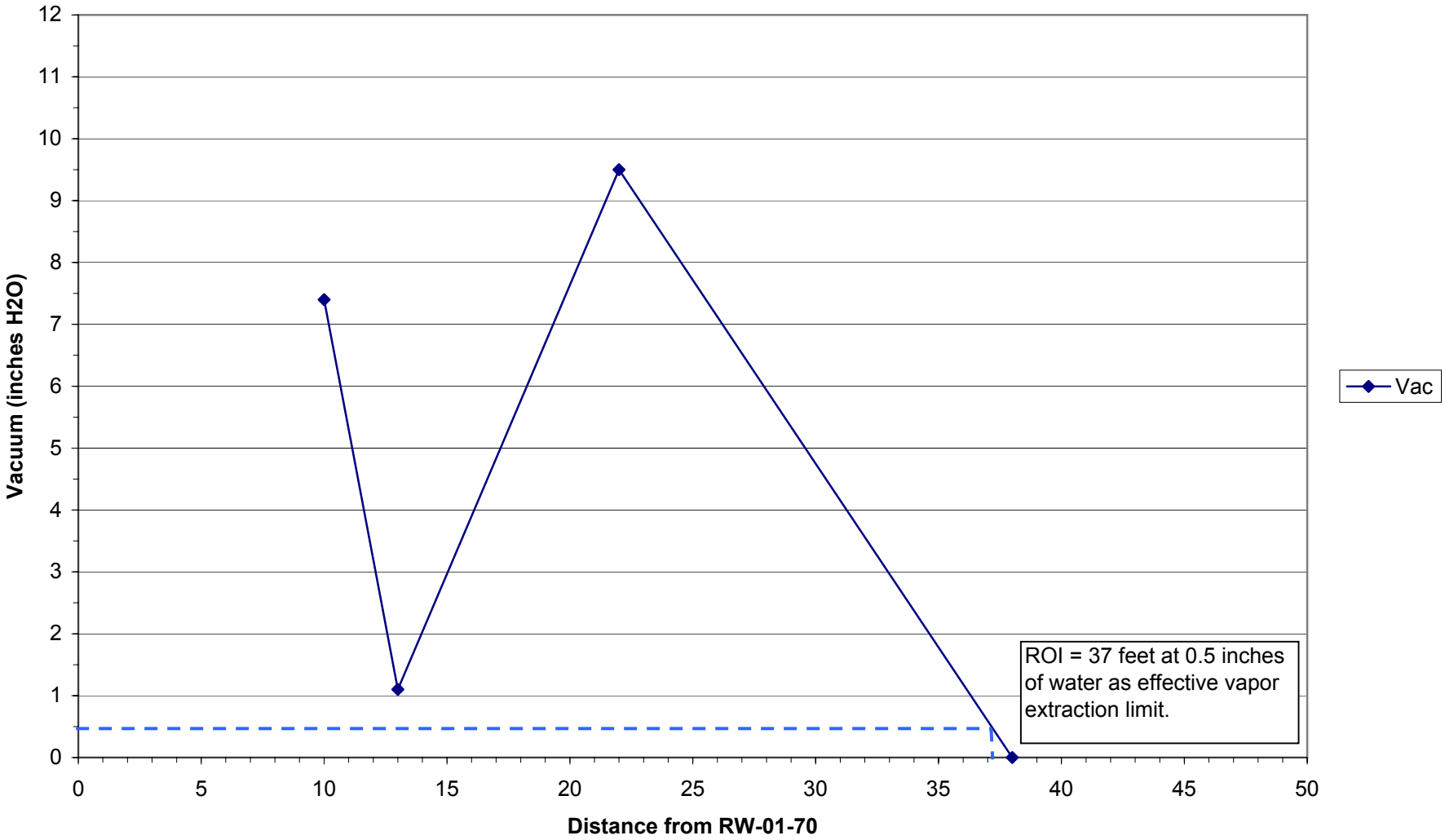


Graph 7A - HVDPE Distance vs. Drawdown - 'A' Zone (Vacuum Assisted)
Pemaco Superfund Site, Maywood, California

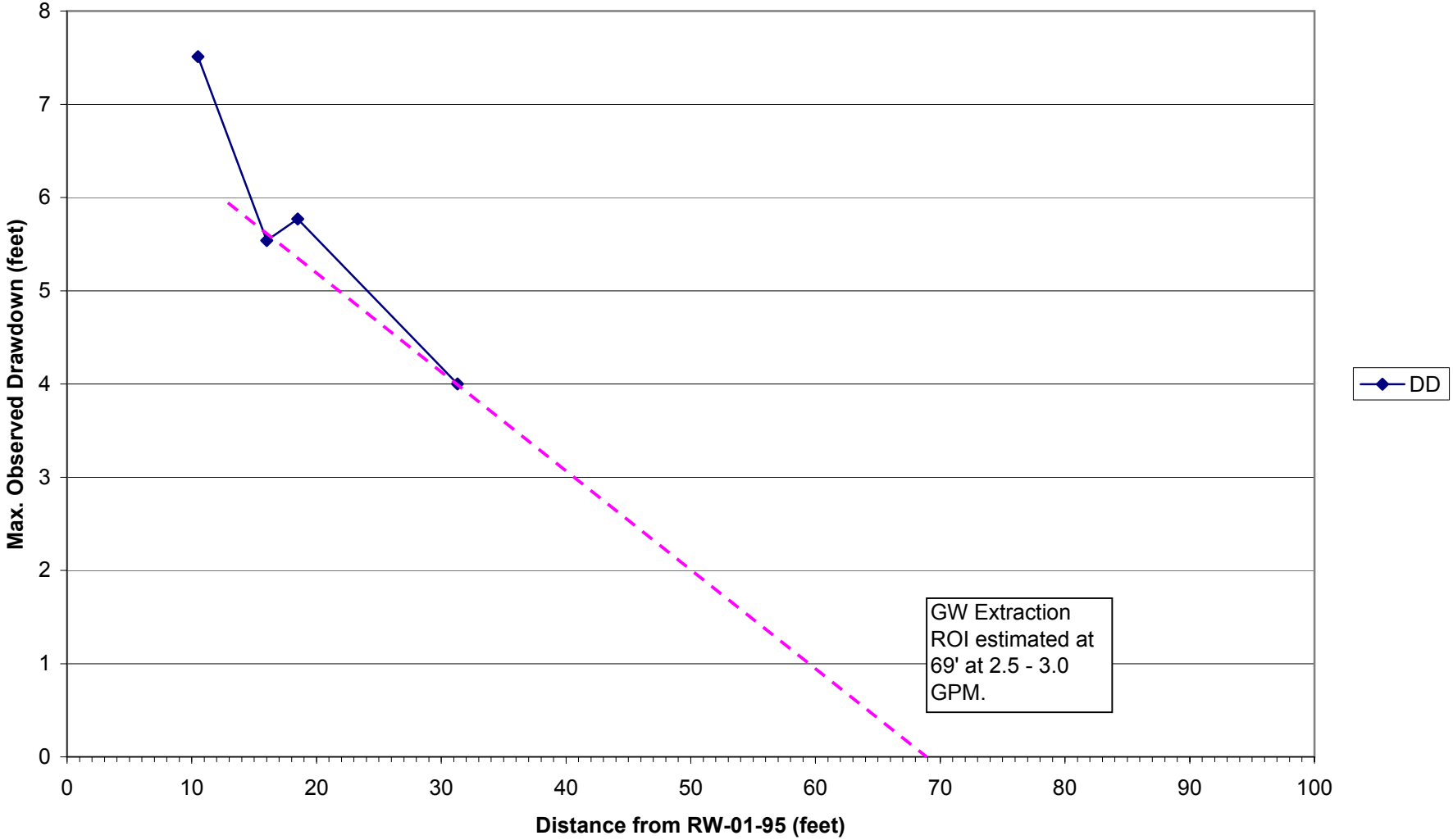


Graph 7B - HVDPE Distance vs. Vacuum - 'A' Zone (Vacuum Assisted)

Pemaco Superfund Site, Maywood, California

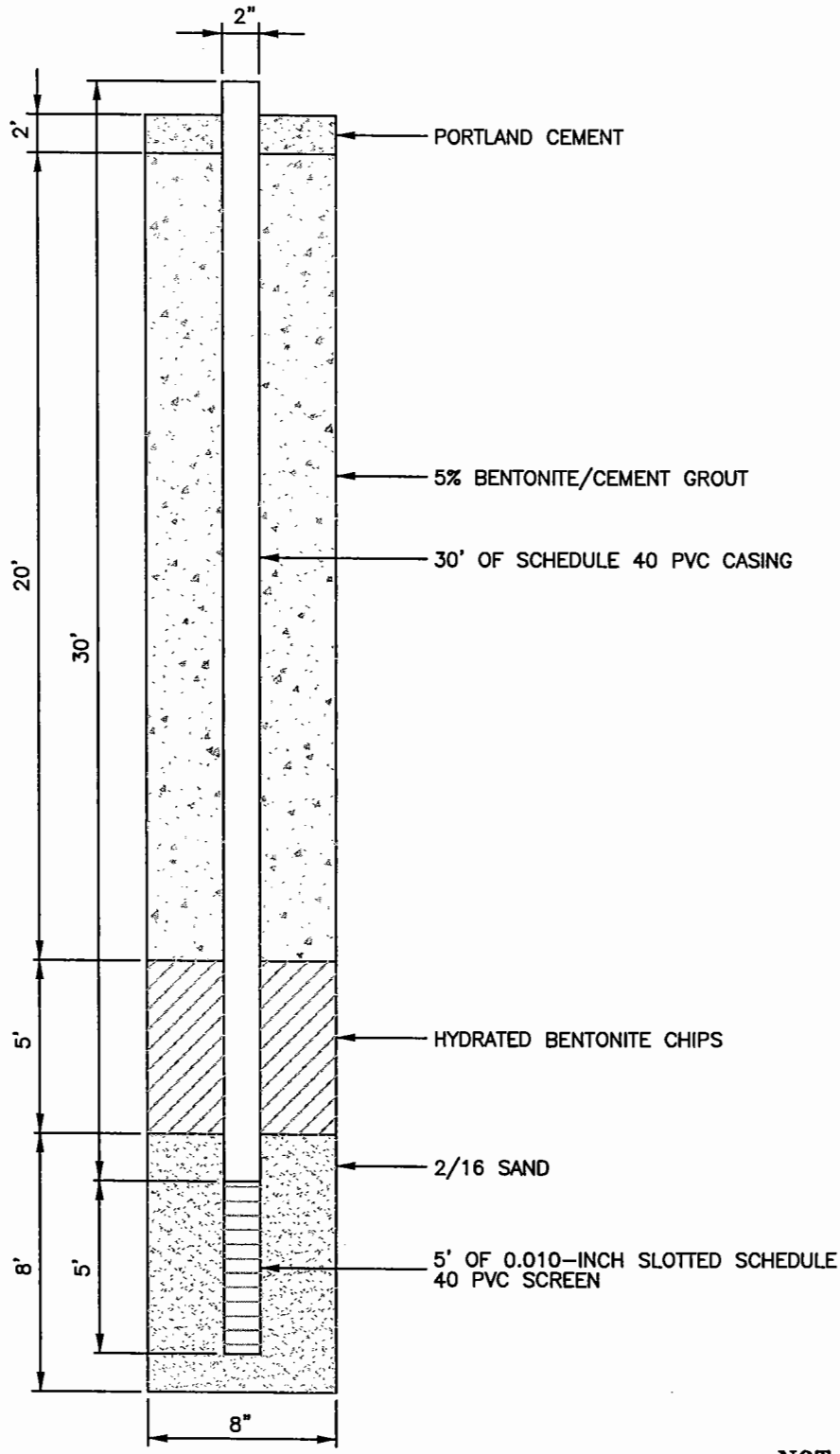


Graph 8 - HVDPE Distance vs. Drawdown - 'B' Zone
Pemaco Superfund Site, Maywood, California



ATTACHMENT A

WELL CONSTRUCTION DIAGRAMS



NOT TO SCALE

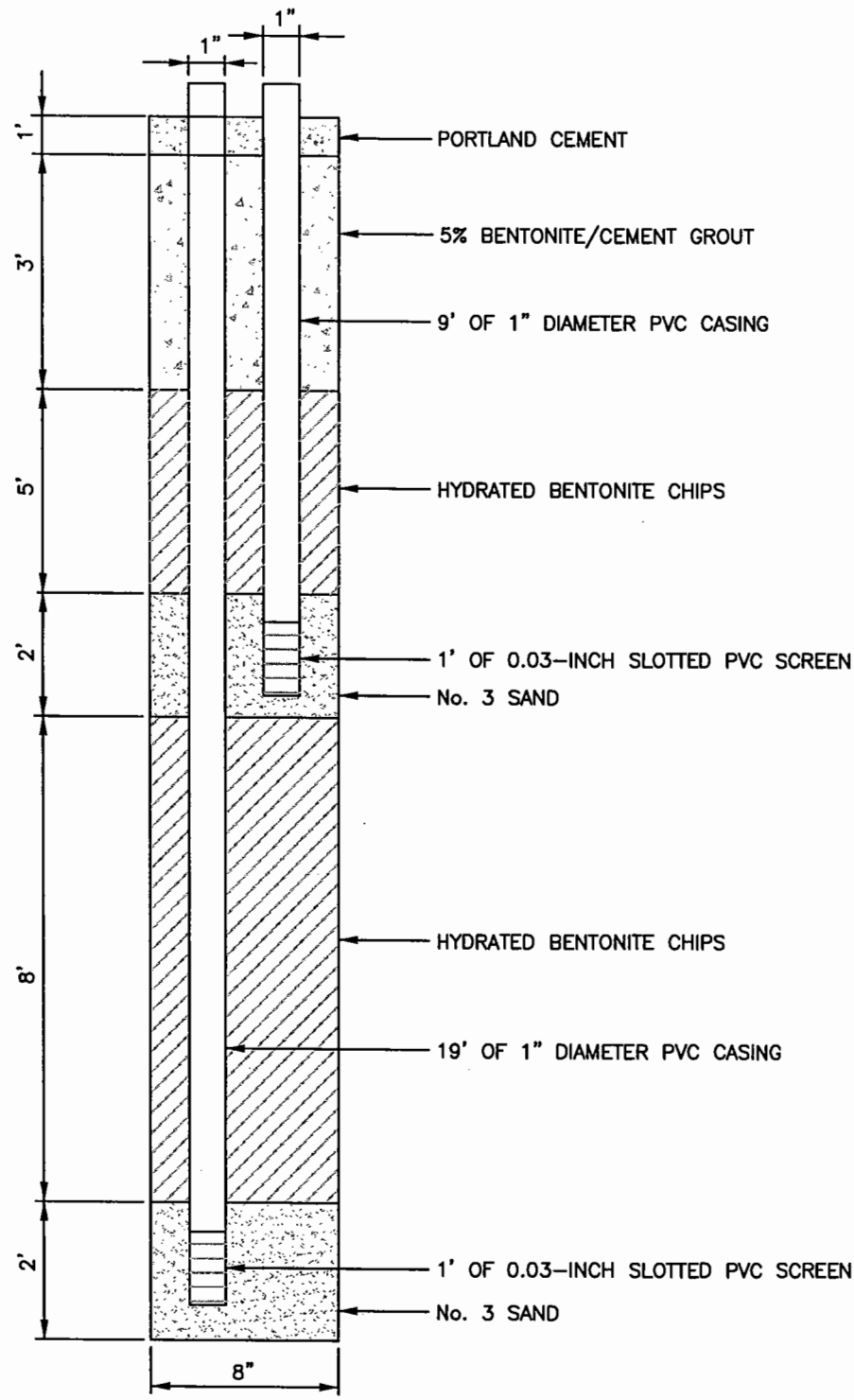
DATE:	FILE NAME:	APPROVED BY:
11/14/2002	WCD-FIG5.DWG	

WELL CONSTRUCTION DIAGRAM
OB-1W

PEMACO SUPERFUND SITE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE
A1



NOT TO SCALE

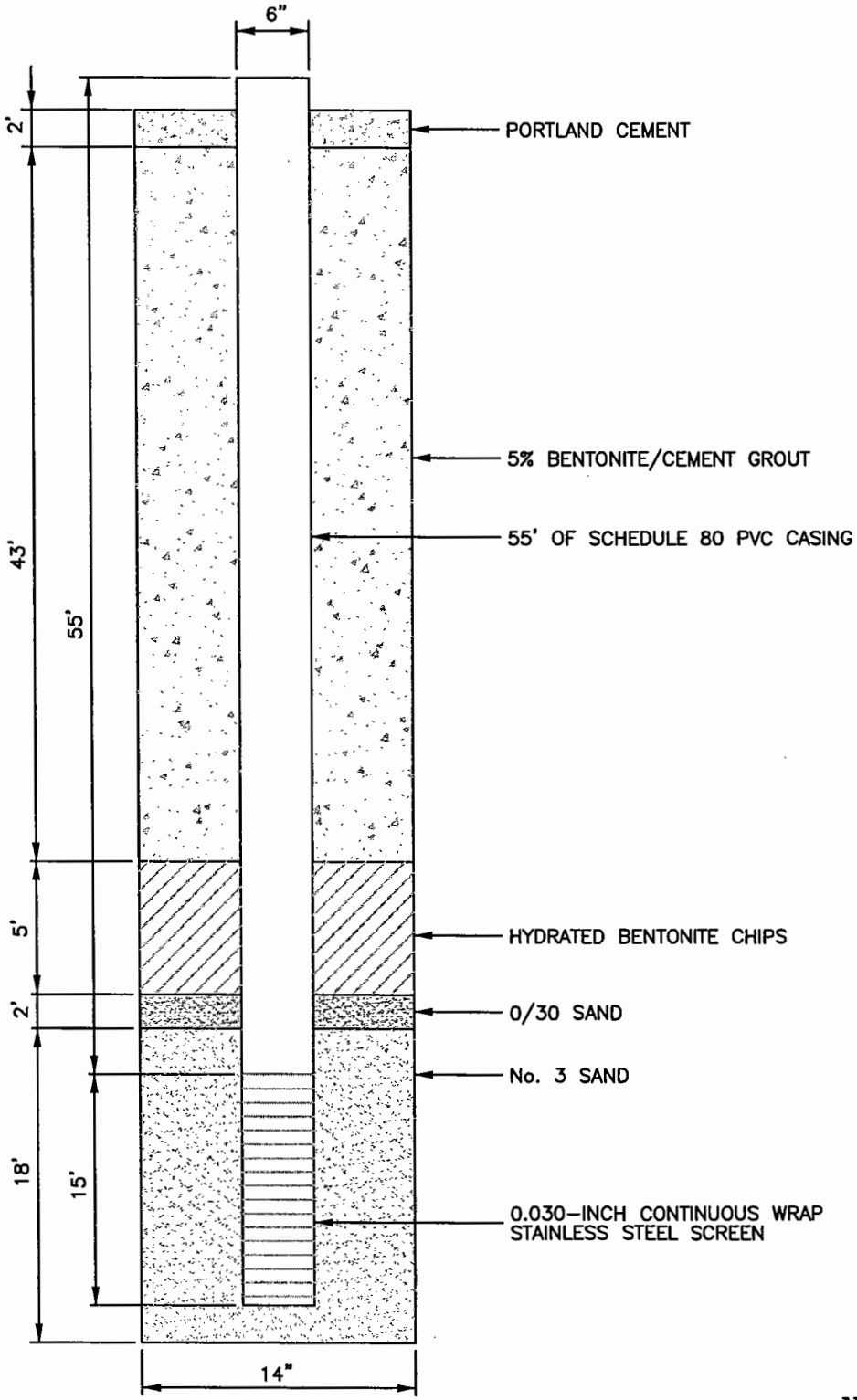
DATE:	FILE NAME:	APPROVED BY:
11/14/2002	WCD–FIG6.DWG	

WELL CONSTRUCTION DIAGRAM
OB–1V

PEMACO SUPERFUND SITE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE
A2



NOT TO SCALE

DATE:	FILE NAME:	APPROVED BY:
11/14/2002	WCD-FIG7.DWG	

WELL CONSTRUCTION DIAGRAM
RW-01-70

PEMACO SUPERFUND SITE
MAYWOOD, CALIFORNIA

T N & Associates, Inc.
Engineering and Science

FIGURE
A3

ATTACHMENT B

LABORATORY REPORTS

Calscience
Environmental
Laboratories, Inc.

December 13, 2002

Ewelina Mutkowska
TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Subject: **Calscience Work Order No.:** **02-12-0514**
Client Reference: **PEMACO 2002191 / 84 / 8401**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/9/2002 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Paul Mead
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/09/02
Engineering & Science		Work Order No:	02-12-0514
468 East Main Street		Preparation:	N/A
Ventura, CA 93001		Method:	EPA TO-15

Project: PEMACO 2002191 / 84 / 8401

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SV-01	02-12-0514-1	12/09/02	Air	N/A	12/10/02	021210L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	1.0	2		ppb (v/v)	1,1,2-Trichloroethane	ND	1.0	2		ppb (v/v)
Chloromethane	ND	1.0	2		ppb (v/v)	Toluene	10	1	2		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoro ethane	ND	4.0	2		ppb (v/v)	2-Hexanone	ND	2.0	2		ppb (v/v)
Vinyl Chloride	ND	1.0	2		ppb (v/v)	4-Methyl-2-Pentanone	ND	2.0	2		ppb (v/v)
Bromomethane	ND	1.0	2		ppb (v/v)	Dibromochloromethane	ND	1.0	2		ppb (v/v)
Chloroethane	ND	1.0	2		ppb (v/v)	Trichloroethene	18	1	2		ppb (v/v)
Trichlorofluoromethane	ND	1.0	2		ppb (v/v)	1,2-Dibromoethane	ND	1.0	2		ppb (v/v)
Acetone	ND	2.0	2		ppb (v/v)	Tetrachloroethene	200	5	10	D	ppb (v/v)
1,1-Dichloroethene	ND	1.0	2		ppb (v/v)	Chlorobenzene	ND	1.0	2		ppb (v/v)
Methylene Chloride	ND	4.0	2		ppb (v/v)	Ethylbenzene	37	1	2		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroeth ane	ND	2.0	2		ppb (v/v)	p/m-Xylene	21	2	2		ppb (v/v)
Carbon Disulfide	ND	1.0	2		ppb (v/v)	Bromoform	ND	1.0	2		ppb (v/v)
t-1,2-Dichloroethene	57	1	2		ppb (v/v)	Styrene	ND	2.0	2		ppb (v/v)
1,1-Dichloroethane	40	1	2		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	1.0	2		ppb (v/v)
Vinyl Acetate	ND	2.0	2		ppb (v/v)	o-Xylene	6.6	1.0	2		ppb (v/v)
2-Butanone	ND	2.0	2		ppb (v/v)	4-Ethyltoluene	ND	1.0	2		ppb (v/v)
c-1,2-Dichloroethene	58	1	2		ppb (v/v)	1,3,5-Trimethylbenzene	ND	1.0	2		ppb (v/v)
Chloroform	ND	1.0	2		ppb (v/v)	1,2,4-Trimethylbenzene	3.2	2.0	2		ppb (v/v)
1,2-Dichloroethane	ND	1.0	2		ppb (v/v)	Benzyl Chloride	ND	2.0	2		ppb (v/v)
1,1,1-Trichloroethane	23	1	2		ppb (v/v)	1,3-Dichlorobenzene	ND	1.0	2		ppb (v/v)
Benzene	13	1	2		ppb (v/v)	1,4-Dichlorobenzene	ND	1.0	2		ppb (v/v)
Carbon Tetrachloride	ND	1.0	2		ppb (v/v)	1,2-Dichlorobenzene	ND	1.0	2		ppb (v/v)
1,2-Dichloropropane	ND	1.0	2		ppb (v/v)	1,2,4-Trichlorobenzene	ND	2.0	2		ppb (v/v)
Bromodichloromethane	ND	1.0	2		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	1.0	2		ppb (v/v)
c-1,3-Dichloropropene	ND	1.0	2		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	19	4	2		ppb (v/v)
t-1,3-Dichloropropene	ND	2.0	2		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Date Received: 12/09/02
Work Order No: 02-12-0514
Preparation: N/A
Method: EPA TO-15

Project: PEMACO 2002191 / 84 / 8401

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	095-01-021-1,844	N/A	Air	N/A	12/10/02	021210L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	0.50	1		ppb (v/v)	1,1,2-Trichloroethane	ND	0.50	1		ppb (v/v)
Chloromethane	ND	0.50	1		ppb (v/v)	Toluene	ND	0.50	1		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoro ethane	ND	2.0	1		ppb (v/v)	2-Hexanone	ND	1.0	1		ppb (v/v)
Vinyl Chloride	ND	0.50	1		ppb (v/v)	4-Methyl-2-Pentanone	ND	1.0	1		ppb (v/v)
Bromomethane	ND	0.50	1		ppb (v/v)	Dibromochloromethane	ND	0.50	1		ppb (v/v)
Chloroethane	ND	0.50	1		ppb (v/v)	Trichloroethene	ND	0.50	1		ppb (v/v)
Trichlorofluoromethane	ND	0.50	1		ppb (v/v)	1,2-Dibromoethane	ND	0.50	1		ppb (v/v)
Acetone	ND	1.0	1		ppb (v/v)	Tetrachloroethene	ND	0.50	1		ppb (v/v)
1,1-Dichloroethene	ND	0.50	1		ppb (v/v)	Chlorobenzene	ND	0.50	1		ppb (v/v)
Methylene Chloride	ND	2.0	1		ppb (v/v)	Ethylbenzene	ND	0.50	1		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroeth ane	ND	1.0	1		ppb (v/v)	p/m-Xylene	ND	1.0	1		ppb (v/v)
Carbon Disulfide	ND	0.50	1		ppb (v/v)	Bromoform	ND	0.50	1		ppb (v/v)
t-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	Styrene	ND	1.0	1		ppb (v/v)
1,1-Dichloroethane	ND	0.50	1		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	0.50	1		ppb (v/v)
Vinyl Acetate	ND	1.0	1		ppb (v/v)	o-Xylene	ND	0.50	1		ppb (v/v)
2-Butanone	ND	1.0	1		ppb (v/v)	4-Ethyltoluene	ND	0.50	1		ppb (v/v)
c-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	1,3,5-Trimethylbenzene	ND	0.50	1		ppb (v/v)
Chloroform	ND	0.50	1		ppb (v/v)	1,2,4-Trimethylbenzene	ND	1.0	1		ppb (v/v)
1,2-Dichloroethane	ND	0.50	1		ppb (v/v)	Benzyl Chloride	ND	1.0	1		ppb (v/v)
1,1,1-Trichloroethane	ND	0.50	1		ppb (v/v)	1,3-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Benzene	ND	0.50	1		ppb (v/v)	1,4-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Carbon Tetrachloride	ND	0.50	1		ppb (v/v)	1,2-Dichlorobenzene	ND	0.50	1		ppb (v/v)
1,2-Dichloropropane	ND	0.50	1		ppb (v/v)	1,2,4-Trichlorobenzene	ND	1.0	1		ppb (v/v)
Bromodichloromethane	ND	0.50	1		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	0.50	1		ppb (v/v)
c-1,3-Dichloropropene	ND	0.50	1		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	2.0	1		ppb (v/v)
t-1,3-Dichloropropene	ND	1.0	1		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMACO 2002191 / 84 / 8401

Date Received: 12/09/02
Work Order No: 02-12-0514
Preparation: N/A
Method: EPA TO-15

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-021-1,844	Air	GC/MS K	N/A	12/10/02	021210L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Vinyl Chloride	100	103	60-140	2	0-30	
1,2-Dichloroethane	115	124	60-140	8	0-30	
Benzene	117	116	60-140	1	0-30	
Carbon Tetrachloride	121	128	60-140	6	0-30	
1,2-Dichloropropane	117	120	60-140	3	0-30	
c-1,3-Dichloropropene	133	136	60-140	2	0-30	
1,1,2-Trichloroethane	128	130	60-140	2	0-30	
Toluene	98	113	60-140	14	0-30	
Trichloroethene	113	114	60-140	1	0-30	
1,2-Dibromoethane	104	119	60-140	13	0-30	
Tetrachloroethene	87	102	60-140	16	0-30	
Ethylbenzene	101	120	60-140	17	0-30	
p/m-Xylene	98	116	60-140	17	0-30	
Bromoform	108	120	60-140	10	0-30	
o-Xylene	101	123	60-140	19	0-30	
1,4-Dichlorobenzene	139	120	60-140	15	0-30	
1,2-Dichlorobenzene	139	127	60-140	9	0-30	

Calscience Environmental Laboratories, Inc.

GLOSSARY OF TERMS AND QUALIFIERS

Work Order Number: 02-12-0514

Qualifier	Definition
D	The sample data was reported from a diluted analysis.
ND	Not detected at indicated reporting limit.

CAL[illegible]ENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUST[illegible] RECORD

Date 12/9/02

Page 1 of 1

LABORATORY CLIENT: TN & Associates, INC.
ADDRESS: 468 E. MAIN ST.
CITY: VENTURA STATE: CA ZIP: 93001
TEL: 805 585 6391 FAX: 805 585-2111 E-MAIL: emutkowska@tnainc.com

CLIENT PROJECT NAME / NUMBER: PEMACO 2002191/84/8401
PROJECT CONTACT: JACQUES MARCILLAC
SAMPLER(S): (SIGNATURE)

P.O. NO.:
LAB USE ONLY: 12-0514
COOLER RECEIPT TEMP = °C

TURNAROUND TIME
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ___ / ___ / ___.

SPECIAL INSTRUCTIONS
Call Ewelina Mutkowska w/ questions 805 585-6391

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	LOCATION/DESCRIPTION	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or ___	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	CH_4 / TGNMO (25.1)	FIXED GASES (25.1) or (D1946)				
	SV-01	PEMACO	12/9/02	1720	AIR	1													X						

Relinquished by: (Signature)

Received by: (Signature)

Date: 12/9/02 Time: 1800

Relinquished by: (Signature)

Received by: (Signature)

Date: Time:

Relinquished by: (Signature)

Received for Laboratory by: (Signature)

Date: 12/9/02 Time: 1830

White and Pink to File - Yellow and Pink to Client

10/01/00 Revision

O&O Graphic (714) 898-9702

Calscience
Environmental
Laboratories, Inc.

December 13, 2002

Ewelina Mutkowska
TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Subject: **Calscience Work Order No.: 02-12-0597**
Client Reference: PEMACO 2002191 / 84 / 8402

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/10/2002 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Paul Mead
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0597
468 East Main Street		Preparation:	N/A
Ventura, CA 93001		Method:	EPA TO-15

Project: PEMACO 2002191 / 84 / 8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SV-01	02-12-0597-1	12/10/02	Air	N/A	12/10/02	021210L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	2.5	5		ppb (v/v)	1,1,2-Trichloroethane	ND	2.5	5		ppb (v/v)
Chloromethane	ND	2.5	5		ppb (v/v)	Toluene	17	2	5		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	ND	10	5		ppb (v/v)	2-Hexanone	ND	5.0	5		ppb (v/v)
Vinyl Chloride	16	2	5		ppb (v/v)	4-Methyl-2-Pentanone	ND	5.0	5		ppb (v/v)
Bromomethane	ND	2.5	5		ppb (v/v)	Dibromochloromethane	ND	2.5	5		ppb (v/v)
Chloroethane	ND	2.5	5		ppb (v/v)	Trichloroethene	8.8	2.5	5		ppb (v/v)
Trichlorofluoromethane	ND	2.5	5		ppb (v/v)	1,2-Dibromoethane	ND	2.5	5		ppb (v/v)
Acetone	12	5	5		ppb (v/v)	Tetrachloroethene	100	2	5		ppb (v/v)
1,1-Dichloroethene	5.7	2.5	5		ppb (v/v)	Chlorobenzene	ND	2.5	5		ppb (v/v)
Methylene Chloride	ND	10	5		ppb (v/v)	Ethylbenzene	100	2	5		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	5.0	5		ppb (v/v)	p/m-Xylene	140	5	5		ppb (v/v)
Carbon Disulfide	ND	2.5	5		ppb (v/v)	Bromoform	ND	2.5	5		ppb (v/v)
t-1,2-Dichloroethene	ND	2.5	5		ppb (v/v)	Styrene	ND	5.0	5		ppb (v/v)
1,1-Dichloroethane	16	2	5		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	2.5	5		ppb (v/v)
Vinyl Acetate	ND	5.0	5		ppb (v/v)	o-Xylene	46	2	5		ppb (v/v)
2-Butanone	ND	5.0	5		ppb (v/v)	4-Ethyltoluene	ND	2.5	5		ppb (v/v)
c-1,2-Dichloroethene	23	2	5		ppb (v/v)	1,3,5-Trimethylbenzene	ND	2.5	5		ppb (v/v)
Chloroform	ND	2.5	5		ppb (v/v)	1,2,4-Trimethylbenzene	6.5	5.0	5		ppb (v/v)
1,2-Dichloroethane	ND	2.5	5		ppb (v/v)	Benzyl Chloride	ND	5.0	5		ppb (v/v)
1,1,1-Trichloroethane	17	2	5		ppb (v/v)	1,3-Dichlorobenzene	ND	2.5	5		ppb (v/v)
Benzene	5.7	2.5	5		ppb (v/v)	1,4-Dichlorobenzene	ND	2.5	5		ppb (v/v)
Carbon Tetrachloride	ND	2.5	5		ppb (v/v)	1,2-Dichlorobenzene	ND	2.5	5		ppb (v/v)
1,2-Dichloropropane	ND	2.5	5		ppb (v/v)	1,2,4-Trichlorobenzene	ND	5.0	5		ppb (v/v)
Bromodichloromethane	ND	2.5	5		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	2.5	5		ppb (v/v)
c-1,3-Dichloropropene	ND	2.5	5		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	10	5		ppb (v/v)
t-1,3-Dichloropropene	ND	5.0	5		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0597
468 East Main Street		Preparation:	N/A
Ventura, CA 93001		Method:	EPA TO-15

Project: PEMACO 2002191 / 84 / 8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	095-01-021-1,844	N/A	Air	N/A	12/10/02	021210L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	0.50	1		ppb (v/v)	1,1,2-Trichloroethane	ND	0.50	1		ppb (v/v)
Chloromethane	ND	0.50	1		ppb (v/v)	Toluene	ND	0.50	1		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	ND	2.0	1		ppb (v/v)	2-Hexanone	ND	1.0	1		ppb (v/v)
Vinyl Chloride	ND	0.50	1		ppb (v/v)	4-Methyl-2-Pentanone	ND	1.0	1		ppb (v/v)
Bromomethane	ND	0.50	1		ppb (v/v)	Dibromochloromethane	ND	0.50	1		ppb (v/v)
Chloroethane	ND	0.50	1		ppb (v/v)	Trichloroethene	ND	0.50	1		ppb (v/v)
Trichlorofluoromethane	ND	0.50	1		ppb (v/v)	1,2-Dibromoethane	ND	0.50	1		ppb (v/v)
Acetone	ND	1.0	1		ppb (v/v)	Tetrachloroethene	ND	0.50	1		ppb (v/v)
1,1-Dichloroethene	ND	0.50	1		ppb (v/v)	Chlorobenzene	ND	0.50	1		ppb (v/v)
Methylene Chloride	ND	2.0	1		ppb (v/v)	Ethylbenzene	ND	0.50	1		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	1.0	1		ppb (v/v)	p/m-Xylene	ND	1.0	1		ppb (v/v)
Carbon Disulfide	ND	0.50	1		ppb (v/v)	Bromoform	ND	0.50	1		ppb (v/v)
t-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	Styrene	ND	1.0	1		ppb (v/v)
1,1-Dichloroethane	ND	0.50	1		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	0.50	1		ppb (v/v)
Vinyl Acetate	ND	1.0	1		ppb (v/v)	o-Xylene	ND	0.50	1		ppb (v/v)
2-Butanone	ND	1.0	1		ppb (v/v)	4-Ethyltoluene	ND	0.50	1		ppb (v/v)
c-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	1,3,5-Trimethylbenzene	ND	0.50	1		ppb (v/v)
Chloroform	ND	0.50	1		ppb (v/v)	1,2,4-Trimethylbenzene	ND	1.0	1		ppb (v/v)
1,2-Dichloroethane	ND	0.50	1		ppb (v/v)	Benzyl Chloride	ND	1.0	1		ppb (v/v)
1,1,1-Trichloroethane	ND	0.50	1		ppb (v/v)	1,3-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Benzene	ND	0.50	1		ppb (v/v)	1,4-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Carbon Tetrachloride	ND	0.50	1		ppb (v/v)	1,2-Dichlorobenzene	ND	0.50	1		ppb (v/v)
1,2-Dichloropropane	ND	0.50	1		ppb (v/v)	1,2,4-Trichlorobenzene	ND	1.0	1		ppb (v/v)
Bromodichloromethane	ND	0.50	1		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	0.50	1		ppb (v/v)
c-1,3-Dichloropropene	ND	0.50	1		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	2.0	1		ppb (v/v)
t-1,3-Dichloropropene	ND	1.0	1		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMACO 2002191 / 84 / 8402

Date Received: 12/10/02
Work Order No: 02-12-0597
Preparation: N/A
Method: EPA TO-15

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-021-1,844	Air	GC/MS K	N/A	12/10/02	021210L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Vinyl Chloride	100	103	60-140	2	0-30	
1,2-Dichloroethane	115	124	60-140	8	0-30	
Benzene	117	116	60-140	1	0-30	
Carbon Tetrachloride	121	128	60-140	6	0-30	
1,2-Dichloropropane	117	120	60-140	3	0-30	
c-1,3-Dichloropropene	133	136	60-140	2	0-30	
1,1,2-Trichloroethane	128	130	60-140	2	0-30	
Toluene	98	113	60-140	14	0-30	
Trichloroethene	113	114	60-140	1	0-30	
1,2-Dibromoethane	104	119	60-140	13	0-30	
Tetrachloroethene	87	102	60-140	16	0-30	
Ethylbenzene	101	120	60-140	17	0-30	
p/m-Xylene	98	116	60-140	17	0-30	
Bromoform	108	120	60-140	10	0-30	
o-Xylene	101	123	60-140	19	0-30	
1,4-Dichlorobenzene	139	120	60-140	15	0-30	
1,2-Dichlorobenzene	139	127	60-140	9	0-30	

Calscience Environmental Laboratories, Inc.

GLOSSARY OF TERMS AND QUALIFIERS

Work Order Number: 02-12-0597

Qualifier	Definition
ND	Not detected at indicated reporting limit.

7440 Lincoln Way, Garden Grove, CA 92841-1432 • TEL: (714) 895-5494 • FAX: (714) 894-7501

CAL ENCE ENVIRONMENTAL
LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTO RECORD

Date 12/10/02

Page 1 of 1

LABORATORY CLIENT: TN & ASSOCIATES, INC.

ADDRESS: 468 E. MAIN ST.

CITY VENTURA STATE CA ZIP 93001

TEL: 805 585-6391 FAX: 805 585-2111 E-MAIL: emutkowska@tnainc.com

CLIENT PROJECT NAME / NUMBER: PEMACO SF SITE 2002191 / 84/8402

PROJECT CONTACT: TIM GARVEY

SAMPLER(S): (SIGNATURE) TDR

P.O. NO.:

LAB USE ONLY 12-0597

COOLER RECEIPT TEMP = °C

TURNAROUND TIME
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☑ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ___ / ___ / ___.

SPECIAL INSTRUCTIONS
CALL EWELINA MUTKOWSKA w/ QUESTIONS
805 585-6391
MUST BE ANALYZED w/in 24 HRS.

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	LOCATION/DESCRIPTION	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) & (TO-15)	CH_4 / TGNMO (25.1)	FIXED GASES (25.1) or (D1946)					
	SV-01	PEMACO SUPER-FUND	12/10/02		AIR	1													X							

Relinquished by: (Signature) TDR — Received by: (Signature) — Date: 12/10/02 Time: 1630

Relinquished by: (Signature) — Received by: (Signature) — Date: — Time:

Relinquished by: (Signature) — Received for Laboratory by: (Signature) — Date: 12/10/02 Time: 1730

10/01/00 Revision

Q&Q Graphic (714) 898-9702

Calscience
Environmental
Laboratories, Inc.

December 17, 2002

Tim Garvey
TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Subject: **Calscience Work Order No.:** **02-12-0796**
Client Reference: **PEMACO HVDPE PILOT / 2002191-84-8402**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/12/2002 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Paul Mead
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates	Date Received:	12/12/02
Engineering & Science	Work Order No:	02-12-0796
468 East Main Street	Preparation:	N/A
Ventura, CA 93001	Method:	EPA TO-15

Project: PEMACO HVDPE PILOT / 2002191-84-8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
EFFLUENT PEMACO	02-12-0796-1	12/12/02	Air	N/A	12/13/02	021213L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	1.3	2.5		ppb (v/v)	1,1,2-Trichloroethane	ND	1.3	2.5		ppb (v/v)
Chloromethane	ND	1.3	2.5		ppb (v/v)	Toluene	3.0	1.3	2.5		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	ND	5.0	2.5		ppb (v/v)	2-Hexanone	ND	2.5	2.5		ppb (v/v)
Vinyl Chloride	ND	1.3	2.5		ppb (v/v)	4-Methyl-2-Pentanone	ND	2.5	2.5		ppb (v/v)
Bromomethane	ND	1.3	2.5		ppb (v/v)	Dibromochloromethane	ND	1.3	2.5		ppb (v/v)
Chloroethane	ND	1.3	2.5		ppb (v/v)	Trichloroethene	ND	1.3	2.5		ppb (v/v)
Trichlorofluoromethane	ND	1.3	2.5		ppb (v/v)	1,2-Dibromoethane	ND	1.3	2.5		ppb (v/v)
Acetone	4.6	2.5	2.5		ppb (v/v)	Tetrachloroethene	ND	1.3	2.5		ppb (v/v)
1,1-Dichloroethene	ND	1.3	2.5		ppb (v/v)	Chlorobenzene	ND	1.3	2.5		ppb (v/v)
Methylene Chloride	6.4	5.0	2.5		ppb (v/v)	Ethylbenzene	6.7	1.3	2.5		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	2.5	2.5		ppb (v/v)	p/m-Xylene	34	2	2.5		ppb (v/v)
Carbon Disulfide	ND	1.3	2.5		ppb (v/v)	Bromoform	ND	1.3	2.5		ppb (v/v)
t-1,2-Dichloroethene	ND	1.3	2.5		ppb (v/v)	Styrene	ND	2.5	2.5		ppb (v/v)
1,1-Dichloroethane	ND	1.3	2.5		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	1.3	2.5		ppb (v/v)
Vinyl Acetate	ND	2.5	2.5		ppb (v/v)	o-Xylene	11	1	2.5		ppb (v/v)
2-Butanone	ND	2.5	2.5		ppb (v/v)	4-Ethyltoluene	ND	1.3	2.5		ppb (v/v)
c-1,2-Dichloroethene	ND	1.3	2.5		ppb (v/v)	1,3,5-Trimethylbenzene	ND	1.3	2.5		ppb (v/v)
Chloroform	ND	1.3	2.5		ppb (v/v)	1,2,4-Trimethylbenzene	ND	2.5	2.5		ppb (v/v)
1,2-Dichloroethane	ND	1.3	2.5		ppb (v/v)	Benzyl Chloride	ND	2.5	2.5		ppb (v/v)
1,1,1-Trichloroethane	ND	1.3	2.5		ppb (v/v)	1,3-Dichlorobenzene	ND	1.3	2.5		ppb (v/v)
Benzene	ND	1.3	2.5		ppb (v/v)	1,4-Dichlorobenzene	ND	1.3	2.5		ppb (v/v)
Carbon Tetrachloride	ND	1.3	2.5		ppb (v/v)	1,2-Dichlorobenzene	ND	1.3	2.5		ppb (v/v)
1,2-Dichloropropane	ND	1.3	2.5		ppb (v/v)	1,2,4-Trichlorobenzene	ND	2.5	2.5		ppb (v/v)
Bromodichloromethane	ND	1.3	2.5		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	1.3	2.5		ppb (v/v)
c-1,3-Dichloropropene	ND	1.3	2.5		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	5.0	2.5		ppb (v/v)
t-1,3-Dichloropropene	ND	2.5	2.5		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates	Date Received:	12/12/02
Engineering & Science	Work Order No:	02-12-0796
468 East Main Street	Preparation:	N/A
Ventura, CA 93001	Method:	EPA TO-15

Project: PEMACO HVDPE PILOT / 2002191-84-8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
RW-01-95	02-12-0796-2	12/12/02	Air	N/A	12/13/02	021213L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	1.0	2		ppb (v/v)	1,1,2-Trichloroethane	ND	1.0	2		ppb (v/v)
Chloromethane	ND	1.0	2		ppb (v/v)	Toluene	3.4	1.0	2		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	ND	4.0	2		ppb (v/v)	2-Hexanone	ND	2.0	2		ppb (v/v)
Vinyl Chloride	ND	1.0	2		ppb (v/v)	4-Methyl-2-Pentanone	ND	2.0	2		ppb (v/v)
Bromomethane	ND	1.0	2		ppb (v/v)	Dibromochloromethane	ND	1.0	2		ppb (v/v)
Chloroethane	ND	1.0	2		ppb (v/v)	Trichloroethene	89	1	2		ppb (v/v)
Trichlorofluoromethane	ND	1.0	2		ppb (v/v)	1,2-Dibromoethane	ND	1.0	2		ppb (v/v)
Acetone	7.7	2.0	2		ppb (v/v)	Tetrachloroethene	ND	1.0	2		ppb (v/v)
1,1-Dichloroethene	ND	1.0	2		ppb (v/v)	Chlorobenzene	ND	1.0	2		ppb (v/v)
Methylene Chloride	ND	4.0	2		ppb (v/v)	Ethylbenzene	4.5	1.0	2		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	2.0	2		ppb (v/v)	p/m-Xylene	22	2	2		ppb (v/v)
Carbon Disulfide	2.2	1.0	2		ppb (v/v)	Bromoform	ND	1.0	2		ppb (v/v)
t-1,2-Dichloroethene	ND	1.0	2		ppb (v/v)	Styrene	ND	2.0	2		ppb (v/v)
1,1-Dichloroethane	ND	1.0	2		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	1.0	2		ppb (v/v)
Vinyl Acetate	ND	2.0	2		ppb (v/v)	o-Xylene	6.7	1.0	2		ppb (v/v)
2-Butanone	ND	2.0	2		ppb (v/v)	4-Ethyltoluene	ND	1.0	2		ppb (v/v)
c-1,2-Dichloroethene	14	1	2		ppb (v/v)	1,3,5-Trimethylbenzene	ND	1.0	2		ppb (v/v)
Chloroform	ND	1.0	2		ppb (v/v)	1,2,4-Trimethylbenzene	ND	2.0	2		ppb (v/v)
1,2-Dichloroethane	ND	1.0	2		ppb (v/v)	Benzyl Chloride	ND	2.0	2		ppb (v/v)
1,1,1-Trichloroethane	ND	1.0	2		ppb (v/v)	1,3-Dichlorobenzene	ND	1.0	2		ppb (v/v)
Benzene	ND	1.0	2		ppb (v/v)	1,4-Dichlorobenzene	ND	1.0	2		ppb (v/v)
Carbon Tetrachloride	ND	1.0	2		ppb (v/v)	1,2-Dichlorobenzene	ND	1.0	2		ppb (v/v)
1,2-Dichloropropane	ND	1.0	2		ppb (v/v)	1,2,4-Trichlorobenzene	ND	2.0	2		ppb (v/v)
Bromodichloromethane	ND	1.0	2		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	1.0	2		ppb (v/v)
c-1,3-Dichloropropene	ND	1.0	2		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	4.0	2		ppb (v/v)
t-1,3-Dichloropropene	ND	2.0	2		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/12/02
Engineering & Science		Work Order No:	02-12-0796
468 East Main Street		Preparation:	N/A
Ventura, CA 93001		Method:	EPA TO-15

Project: PEMACO HVDPE PILOT / 2002191-84-8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	095-01-021-1,847	N/A	Air	N/A	12/13/02	021213L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	0.50	1		ppb (v/v)	1,1,2-Trichloroethane	ND	0.50	1		ppb (v/v)
Chloromethane	ND	0.50	1		ppb (v/v)	Toluene	ND	0.50	1		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	ND	2.0	1		ppb (v/v)	2-Hexanone	ND	1.0	1		ppb (v/v)
Vinyl Chloride	ND	0.50	1		ppb (v/v)	4-Methyl-2-Pentanone	ND	1.0	1		ppb (v/v)
Bromomethane	ND	0.50	1		ppb (v/v)	Dibromochloromethane	ND	0.50	1		ppb (v/v)
Chloroethane	ND	0.50	1		ppb (v/v)	Trichloroethene	ND	0.50	1		ppb (v/v)
Trichlorofluoromethane	ND	0.50	1		ppb (v/v)	1,2-Dibromoethane	ND	0.50	1		ppb (v/v)
Acetone	ND	1.0	1		ppb (v/v)	Tetrachloroethene	ND	0.50	1		ppb (v/v)
1,1-Dichloroethene	ND	0.50	1		ppb (v/v)	Chlorobenzene	ND	0.50	1		ppb (v/v)
Methylene Chloride	ND	2.0	1		ppb (v/v)	Ethylbenzene	ND	0.50	1		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	1.0	1		ppb (v/v)	p/m-Xylene	ND	1.0	1		ppb (v/v)
Carbon Disulfide	ND	0.50	1		ppb (v/v)	Bromoform	ND	0.50	1		ppb (v/v)
t-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	Styrene	ND	1.0	1		ppb (v/v)
1,1-Dichloroethane	ND	0.50	1		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	0.50	1		ppb (v/v)
Vinyl Acetate	ND	1.0	1		ppb (v/v)	o-Xylene	ND	0.50	1		ppb (v/v)
2-Butanone	ND	1.0	1		ppb (v/v)	4-Ethyltoluene	ND	0.50	1		ppb (v/v)
c-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	1,3,5-Trimethylbenzene	ND	0.50	1		ppb (v/v)
Chloroform	ND	0.50	1		ppb (v/v)	1,2,4-Trimethylbenzene	ND	1.0	1		ppb (v/v)
1,2-Dichloroethane	ND	0.50	1		ppb (v/v)	Benzyl Chloride	ND	1.0	1		ppb (v/v)
1,1,1-Trichloroethane	ND	0.50	1		ppb (v/v)	1,3-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Benzene	ND	0.50	1		ppb (v/v)	1,4-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Carbon Tetrachloride	ND	0.50	1		ppb (v/v)	1,2-Dichlorobenzene	ND	0.50	1		ppb (v/v)
1,2-Dichloropropane	ND	0.50	1		ppb (v/v)	1,2,4-Trichlorobenzene	ND	1.0	1		ppb (v/v)
Bromodichloromethane	ND	0.50	1		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	0.50	1		ppb (v/v)
c-1,3-Dichloropropene	ND	0.50	1		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	2.0	1		ppb (v/v)
t-1,3-Dichloropropene	ND	1.0	1		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMACO HVDPE PILOT / 2002191-84-8402

Date Received: 12/12/02
Work Order No: 02-12-0796
Preparation: N/A
Method: EPA TO-15

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-021-1,847	Air	GC/MS K	N/A	12/13/02	021213L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Vinyl Chloride	101	103	60-140	1	0-30	
1,2-Dichloroethane	113	106	60-140	7	0-30	
Benzene	109	105	60-140	4	0-30	
Carbon Tetrachloride	119	112	60-140	6	0-30	
1,2-Dichloropropane	110	103	60-140	7	0-30	
c-1,3-Dichloropropene	123	114	60-140	7	0-30	
1,1,2-Trichloroethane	117	106	60-140	9	0-30	
Toluene	106	102	60-140	3	0-30	
Trichloroethene	108	103	60-140	4	0-30	
1,2-Dibromoethane	110	106	60-140	3	0-30	
Tetrachloroethene	100	100	60-140	0	0-30	
Ethylbenzene	111	106	60-140	4	0-30	
p/m-Xylene	106	104	60-140	2	0-30	
Bromoform	106	104	60-140	2	0-30	
o-Xylene	116	110	60-140	6	0-30	
1,4-Dichlorobenzene	93	93	60-140	0	0-30	
1,2-Dichlorobenzene	117	105	60-140	11	0-30	

Calscience Environmental Laboratories, Inc.

GLOSSARY OF TERMS AND QUALIFIERS

Work Order Number: 02-12-0796

Qualifier	Definition
ND	Not detected at indicated reporting limit.

7440 Lincoln Way, Garden Grove, CA 92841-1432 • TEL: (714) 895-5494 • FAX: (714) 894-7501

CAL ENCE ENVIRONMENTAL
LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 12/12/02

Page 1 of 1

LABORATORY CLIENT: TN & ASSOCIATES, INC.

ADDRESS: 468 E. MAIN ST.

CITY: VENTURA STATE: CA ZIP: 93001

TEL: 805 585 6391 FAX: 805 585 2111 E-MAIL: emutkowska@trainc.com

CLIENT PROJECT NAME / NUMBER: PEMACO HVDPE PILOT 2002191-8402

PROJECT CONTACT: TIM GARVEY

SAMPLER(S): (SIGNATURE)

P.O. NO.:

LAB USE ONLY 12-0796

COOLER RECEIPT TEMP = °C

TURNAROUND TIME
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ___ / ___ / ___.

SPECIAL INSTRUCTIONS
ANALYZE W/IN 24 HRS.
QUESTIONS / RESULTS TO EWELINA MUTKOWSKA
805 585 6391
* RW-01-95 SAMPLE HOT!

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	LOCATION/DESCRIPTION	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or ___	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	CH_4 / TGNMO (25.1)	FIXED GASES (25.1) or (D1946)				
1	EFFLUENT	PEMACO	12/12/02	1610	AIR	1													X						
2	RW-01-95	"	"	1625	"	1													X						
	* RW-01-95 SAMPLE HOT																								
	~ 500 - 1,000 ppm																								

Relinquished by: (Signature)

Relinquished by: (Signature)

Relinquished by: (Signature)

Received by: (Signature)

Received by: (Signature)

Received for Laboratory by: (Signature)

Date: 12 12 02 Time: 16 30

Date: Time:

Date: 12 12 02 Time: 17 25

10/01/00 Revision

Calscience
Environmental
Laboratories, Inc.

December 20, 2002

Ewelina Mutkowska
TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Subject: **Calscience Work Order No.: 02-12-0920**
Client Reference: PEMECO SF SITE

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/13/2002 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Paul Mead
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Date Received: 12/13/02
Work Order No: 02-12-0920
Preparation: Total Digestion
Method: EPA 6010B / EPA 7470A

Project: PEMECO SF SITE

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
TANK 241261	02-12-0920-1	12/13/02	Aqueous	12/16/02	12/17/02	021216L03

Comment(s): Mercury was analyzed on 12/16/2002 7:22:49 PM with batch 021216L03

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Antimony	ND	0.0150	1		mg/L	Mercury	ND	0.00050	1		mg/L
Arsenic	ND	0.0150	1		mg/L	Molybdenum	0.0154	0.0050	1		mg/L
Barium	0.112	0.010	1		mg/L	Nickel	0.0167	0.0050	1		mg/L
Beryllium	ND	0.00100	1		mg/L	Selenium	ND	0.0150	1		mg/L
Cadmium	ND	0.00500	1		mg/L	Silver	ND	0.00500	1		mg/L
Chromium (Total)	0.0166	0.0050	1		mg/L	Thallium	ND	0.0150	1		mg/L
Cobalt	0.00248	0.00500	1	J	mg/L	Vanadium	0.0143	0.0050	1		mg/L
Copper	0.00959	0.00500	1		mg/L	Zinc	0.0284	0.0100	1		mg/L
Lead	0.00277	0.0100	1	J	mg/L						

Method Blank	099-04-008-998	N/A	Aqueous	12/16/02	12/16/02	021216L03

Parameter	Result	RL	DF	Qual	Units
Mercury	ND	0.00050	1		mg/L

Method Blank	097-01-003-2,713	N/A	Aqueous	12/16/02	12/16/02	021216L03

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Antimony	ND	0.0150	1		mg/L	Molybdenum	ND	0.00500	1		mg/L
Arsenic	ND	0.0150	1		mg/L	Nickel	ND	0.00500	1		mg/L
Barium	ND	0.0100	1		mg/L	Selenium	ND	0.0150	1		mg/L
Beryllium	ND	0.00100	1		mg/L	Silver	ND	0.00500	1		mg/L
Cadmium	ND	0.00500	1		mg/L	Thallium	ND	0.0150	1		mg/L
Chromium (Total)	ND	0.00500	1		mg/L	Vanadium	ND	0.00500	1		mg/L
Cobalt	ND	0.00500	1		mg/L	Zinc	ND	0.0100	1		mg/L
Copper	ND	0.00500	1		mg/L	Lead	ND	0.0100	1		mg/L

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/13/02
Engineering & Science		Work Order No:	02-12-0920
468 East Main Street		Preparation:	Ext. + D/I
Ventura, CA 93001		Method:	TPH - Carbon Range

Project: PEMECO SF SITE

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
TANK 241261	02-12-0920-1	12/13/02	Aqueous	12/16/02	12/16/02	021216B07

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
C7	1100		1		ug/L	C19-C20	ND		1		ug/L
C8	ND		1		ug/L	C21-C22	ND		1		ug/L
C9-C10	ND		1		ug/L	C23-C24	ND		1		ug/L
C11-C12	ND		1		ug/L	C25-C28	ND		1		ug/L
C13-C14	ND		1		ug/L	C29-C32	ND		1		ug/L
C15-C16	ND		1		ug/L	C33-C36	ND		1		ug/L
C17-C18	ND		1		ug/L	C7-C36 Total	1100	1000	1		ug/L

Surrogates:	REC (%)	Control Limits	Qual
Decachlorobiphenyl	96	51-141	

Method Blank	098-03-003-1,260	N/A	Aqueous	12/16/02	12/16/02	021216B07

Parameter	Result	RL	DF	Qual	Units
TPH as Diesel	ND	1000	1		ug/L

Surrogates:	REC (%)	Control Limits	Qual
Decachlorobiphenyl	103	51-141	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Date Received: 12/13/02
Work Order No: 02-12-0920
Preparation: EPA 5030B
Method: EPA 8260B

Project: PEMECO SF SITE

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
TANK 241261	02-12-0920-1	12/13/02	Aqueous	N/A	12/14/02	021213L02

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Acetone	ND	100	10		ug/L	1,3-Dichloropropane	ND	10	10		ug/L
Benzene	ND	5.0	10		ug/L	2,2-Dichloropropane	ND	10	10		ug/L
Bromobenzene	ND	10	10		ug/L	1,1-Dichloropropene	ND	10	10		ug/L
Bromochloromethane	ND	10	10		ug/L	c-1,3-Dichloropropene	ND	5.0	10		ug/L
Bromodichloromethane	ND	10	10		ug/L	t-1,3-Dichloropropene	ND	5.0	10		ug/L
Bromoform	ND	10	10		ug/L	Ethylbenzene	ND	10	10		ug/L
Bromomethane	ND	100	10		ug/L	2-Hexanone	ND	100	10		ug/L
2-Butanone	ND	100	10		ug/L	Isopropylbenzene	ND	10	10		ug/L
n-Butylbenzene	ND	10	10		ug/L	p-Isopropyltoluene	ND	10	10		ug/L
sec-Butylbenzene	ND	10	10		ug/L	Methylene Chloride	ND	100	10		ug/L
tert-Butylbenzene	ND	10	10		ug/L	4-Methyl-2-Pentanone	ND	100	10		ug/L
Carbon Disulfide	ND	100	10		ug/L	Naphthalene	ND	100	10		ug/L
Carbon Tetrachloride	ND	5.0	10		ug/L	n-Propylbenzene	ND	10	10		ug/L
Chlorobenzene	ND	10	10		ug/L	Styrene	ND	10	10		ug/L
Chloroethane	ND	10	10		ug/L	1,1,1,2-Tetrachloroethane	ND	10	10		ug/L
Chloroform	ND	10	10		ug/L	1,1,2,2-Tetrachloroethane	ND	10	10		ug/L
Chloromethane	ND	100	10		ug/L	Tetrachloroethene	ND	10	10		ug/L
2-Chlorotoluene	ND	10	10		ug/L	Toluene	5.0	10.0	10	J	ug/L
4-Chlorotoluene	ND	10	10		ug/L	1,2,3-Trichlorobenzene	ND	10	10		ug/L
Dibromochloromethane	ND	10	10		ug/L	1,2,4-Trichlorobenzene	ND	10	10		ug/L
1,2-Dibromo-3-Chloropropane	ND	50	10		ug/L	1,1,1-Trichloroethane	ND	10	10		ug/L
1,2-Dibromoethane	ND	10	10		ug/L	1,1,2-Trichloroethane	ND	10	10		ug/L
Dibromomethane	ND	10	10		ug/L	Trichloroethene	5800	100	100	D	ug/L
1,2-Dichlorobenzene	ND	10	10		ug/L	Trichlorofluoromethane	ND	100	10		ug/L
1,3-Dichlorobenzene	ND	10	10		ug/L	1,2,3-Trichloropropane	ND	50	10		ug/L
1,4-Dichlorobenzene	ND	10	10		ug/L	1,2,4-Trimethylbenzene	ND	10	10		ug/L
Dichlorodifluoromethane	ND	10	10		ug/L	1,3,5-Trimethylbenzene	ND	10	10		ug/L
1,1-Dichloroethane	ND	10	10		ug/L	Vinyl Acetate	ND	100	10		ug/L
1,2-Dichloroethane	ND	5.0	10		ug/L	Vinyl Chloride	15	5	10		ug/L
1,1-Dichloroethene	ND	10	10		ug/L	p/m-Xylene	ND	10	10		ug/L
c-1,2-Dichloroethene	410	10	10		ug/L	o-Xylene	ND	10	10		ug/L
t-1,2-Dichloroethene	ND	10	10		ug/L	Methyl-t-Butyl Ether (MTBE)	ND	10	10		ug/L
1,2-Dichloropropane	ND	10	10		ug/L						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	104	86-118		Toluene-d8	108	88-110	
1,4-Bromofluorobenzene	96	86-115					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/13/02
Engineering & Science		Work Order No:	02-12-0920
468 East Main Street		Preparation:	EPA 5030B
Ventura, CA 93001		Method:	EPA 8260B

Project: PEMECO SF SITE

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	099-10-006-6,462	N/A	Aqueous	N/A	12/14/02	021213L02

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Acetone	ND	10	1		ug/L	1,3-Dichloropropane	ND	1.0	1		ug/L
Benzene	ND	0.50	1		ug/L	2,2-Dichloropropane	ND	1.0	1		ug/L
Bromobenzene	ND	1.0	1		ug/L	1,1-Dichloropropene	ND	1.0	1		ug/L
Bromochloromethane	ND	1.0	1		ug/L	c-1,3-Dichloropropene	ND	0.50	1		ug/L
Bromodichloromethane	ND	1.0	1		ug/L	t-1,3-Dichloropropene	ND	0.50	1		ug/L
Bromoform	ND	1.0	1		ug/L	Ethylbenzene	ND	1.0	1		ug/L
Bromomethane	ND	10	1		ug/L	2-Hexanone	ND	10	1		ug/L
2-Butanone	ND	10	1		ug/L	Isopropylbenzene	ND	1.0	1		ug/L
n-Butylbenzene	ND	1.0	1		ug/L	p-Isopropyltoluene	ND	1.0	1		ug/L
sec-Butylbenzene	ND	1.0	1		ug/L	Methylene Chloride	ND	10	1		ug/L
tert-Butylbenzene	ND	1.0	1		ug/L	4-Methyl-2-Pentanone	ND	10	1		ug/L
Carbon Disulfide	ND	10	1		ug/L	Naphthalene	ND	10	1		ug/L
Carbon Tetrachloride	ND	0.50	1		ug/L	n-Propylbenzene	ND	1.0	1		ug/L
Chlorobenzene	ND	1.0	1		ug/L	Styrene	ND	1.0	1		ug/L
Chloroethane	ND	1.0	1		ug/L	1,1,1,2-Tetrachloroethane	ND	1.0	1		ug/L
Chloroform	ND	1.0	1		ug/L	1,1,2,2-Tetrachloroethane	ND	1.0	1		ug/L
Chloromethane	ND	10	1		ug/L	Tetrachloroethene	ND	1.0	1		ug/L
2-Chlorotoluene	ND	1.0	1		ug/L	Toluene	ND	1.0	1		ug/L
4-Chlorotoluene	ND	1.0	1		ug/L	1,2,3-Trichlorobenzene	ND	1.0	1		ug/L
Dibromochloromethane	ND	1.0	1		ug/L	1,2,4-Trichlorobenzene	ND	1.0	1		ug/L
1,2-Dibromo-3-Chloropropane	ND	5.0	1		ug/L	1,1,1-Trichloroethane	ND	1.0	1		ug/L
1,2-Dibromoethane	ND	1.0	1		ug/L	1,1,2-Trichloroethane	ND	1.0	1		ug/L
Dibromomethane	ND	1.0	1		ug/L	Trichloroethene	ND	1.0	1		ug/L
1,2-Dichlorobenzene	ND	1.0	1		ug/L	Trichlorofluoromethane	ND	10	1		ug/L
1,3-Dichlorobenzene	ND	1.0	1		ug/L	1,2,3-Trichloropropane	ND	5.0	1		ug/L
1,4-Dichlorobenzene	ND	1.0	1		ug/L	1,2,4-Trimethylbenzene	ND	1.0	1		ug/L
Dichlorodifluoromethane	ND	1.0	1		ug/L	1,3,5-Trimethylbenzene	ND	1.0	1		ug/L
1,1-Dichloroethane	ND	1.0	1		ug/L	Vinyl Acetate	ND	10	1		ug/L
1,2-Dichloroethane	ND	0.50	1		ug/L	Vinyl Chloride	ND	0.50	1		ug/L
1,1-Dichloroethene	ND	1.0	1		ug/L	p/m-Xylene	ND	1.0	1		ug/L
c-1,2-Dichloroethene	ND	1.0	1		ug/L	o-Xylene	ND	1.0	1		ug/L
t-1,2-Dichloroethene	ND	1.0	1		ug/L	Methyl-t-Butyl Ether (MTBE)	ND	1.0	1		ug/L
1,2-Dichloropropane	ND	1.0	1		ug/L						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	112	86-118		Toluene-d8	105	88-110	
1,4-Bromofluorobenzene	97	86-115					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
468 East Main Street
Ventura, CA 93001

Date Sampled: 12/13/02
Date Received: 12/13/02

Work Order No.: 02-12-0920
Method: **EPA 8260B**
Additional Compounds

Project: Pemaco SF Site

Client Sample Number	Lab Sample Number:	Matrix:	Date Collected:	Date Extracted:	Date Analyzed:	QC Batch ID:
TANK 241261	02-12-0920-1	Aqueous	12/13/02	N/A	12/14/02	021213L02

Parameter	Result	RL	DF	Qual	Units
Acrylonitrile	ND	20	1		µg/L
Methyl Acetate	ND	20	1		µg/L
Hexane	ND	1.0	1		µg/L
Cyclohexane	53	1.0	1		µg/L
Methylcyclohexane	ND	1.0	1		µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	1		µg/L

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	104	86-118		Toluene-d8	108	88-110	
1,4-Bromofluorobenzene	96	86-115					

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
468 East Main Street
Ventura, CA 93001

Date Sampled: 12/13/02
Date Received: 12/13/02

Work Order No.: 02-12-0920
Method: **EPA 8260B**
Additional Compounds

Project: Pemaco SF Site

Client Sample Number	Lab Sample Number:	Matrix:	Date Collected:	Date Extracted:	Date Analyzed:	QC Batch ID:
Method Blank	099-10-006-6462	Aqueous	N/A	N/A	12/14/02	021213L02

Parameter	Result	RL	DF	Qual	Units
Acrylonitrile	ND	20	1		µg/L
Methyl Acetate	ND	20	1		µg/L
Hexane	ND	1.0	1		µg/L
Cyclohexane	ND	1.0	1		µg/L
Methylcyclohexane	ND	1.0	1		µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	1		µg/L

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	112	86-118		Toluene-d8	105	88-110	
1,4-Bromofluorobenzene	97	86-115					

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/13/02
Engineering & Science		Work Order No:	02-12-0920
468 East Main Street		Preparation:	Total Digestion
Ventura, CA 93001		Method:	EPA 6010B
Project:	PEMECO SF SITE		

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
02-12-0919-1	Aqueous	ICP 3300	12/16/02	12/17/02	021216S03

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Antimony	105	111	80-120	5	0-20	
Arsenic	112	118	80-120	5	0-20	
Barium	106	105	80-120	1	0-20	
Beryllium	103	109	80-120	6	0-20	
Cadmium	100	107	80-120	6	0-20	
Chromium (Total)	97	103	80-120	6	0-20	
Cobalt	104	110	80-120	6	0-20	
Copper	98	105	80-120	6	0-20	
Lead	98	104	80-120	6	0-20	
Molybdenum	104	110	80-120	6	0-20	
Nickel	98	104	80-120	6	0-20	
Selenium	100	106	80-120	6	0-20	
Silver	107	104	80-120	3	0-20	
Thallium	101	106	80-120	5	0-20	
Vanadium	105	111	80-120	6	0-20	
Zinc	95	101	80-120	5	0-20	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMECO SF SITE

Date Received: 12/13/02
Work Order No: 02-12-0920
Preparation: Total Digestion
Method: EPA 6010B

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-003-2,713	Aqueous	ICP 3300	12/16/02	021216L03	021216L03

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Antimony	1.00	1.06	106	80-120	
Arsenic	1.00	1.12	112	80-120	
Barium	1.00	1.14	114	80-120	
Beryllium	1.00	1.03	103	80-120	
Cadmium	1.00	1.05	105	80-120	
Chromium (Total)	1.00	1.04	104	80-120	
Cobalt	1.00	1.11	111	80-120	
Copper	1.00	1.02	102	80-120	
Lead	1.00	1.06	106	80-120	
Molybdenum	1.00	1.02	102	80-120	
Nickel	1.00	1.10	109	80-120	
Selenium	1.00	0.988	99	80-120	
Silver	0.500	0.521	104	80-120	
Thallium	1.00	1.08	108	80-120	
Vanadium	1.00	0.999	100	80-120	
Zinc	1.00	1.07	107	80-120	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/13/02
Engineering & Science		Work Order No:	02-12-0920
468 East Main Street		Preparation:	Total Digestion
Ventura, CA 93001		Method:	EPA 7470A
Project:	PEMECO SF SITE		

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
TANK 241261	Aqueous	Mercury	12/16/02	12/17/02	021216S03

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Mercury	76	74	71-134	2	0-14	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

TN & Associates		Date Received:	12/13/02
Engineering & Science		Work Order No:	02-12-0920
468 East Main Street		Preparation:	Total Digestion
Ventura, CA 93001		Method:	EPA 7470A
Project:	PEMECO SF SITE		

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
099-04-008-998	Aqueous	Mercury	12/16/02	021216-L03	021216L03

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Mercury	0.0100	0.0111	111	90-122	

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

TN & Associates	Date Received: 12/13/02
Engineering & Science	Work Order No: 02-12-0920
468 East Main Street	Preparation: Ext. + D/I
Ventura, CA 93001	Method: TPH - Carbon Range
Project: PEMECO SF SITE	

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
098-03-003-1,260	Aqueous	GC 3	12/16/02	12/16/02	021216B07

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
TPH as Diesel	105	103	60-132	2	0-11	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/13/02
Engineering & Science		Work Order No:	02-12-0920
468 East Main Street		Preparation:	EPA 5030B
Ventura, CA 93001		Method:	EPA 8260B
Project:	PEMECO SF SITE		

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
02-12-0729-1	Aqueous	GC/MS T	N/A	12/14/02	021213S02

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Benzene	98	100	72-127	3	0-25	
Carbon Tetrachloride	117	117	70-130	0	0-25	
Chlorobenzene	96	99	72-131	2	0-25	
1,2-Dichlorobenzene	97	99	70-130	2	0-25	
1,1-Dichloroethene	99	101	69-127	1	0-25	
Toluene	98	98	75-124	0	0-25	
Trichloroethene	85	90	60-137	5	0-25	
Vinyl Chloride	86	92	70-130	7	0-25	
Methyl-t-Butyl Ether (MTBE)	93	99	80-120	6	0-25	
Ethanol	97	102	60-140	6	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMECO SF SITE

Date Received: 12/13/02
Work Order No: 02-12-0920
Preparation: EPA 5030B
Method: EPA 8260B

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
099-10-006-6,462	Aqueous	GC/MS T	12/14/02	13DEC029	021213L02

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Benzene	50	49	98	72-127	
Carbon Tetrachloride	50	58	115	70-130	
Chlorobenzene	50	48	96	72-131	
1,2-Dichlorobenzene	50	49	99	70-130	
1,1-Dichloroethene	50	50	99	69-127	
Toluene	50	50	99	75-124	
Trichloroethene	50	42	85	60-137	
Vinyl Chloride	50	44	88	79-118	
Methyl-t-Butyl Ether (MTBE)	50	54	108	80-120	
Tert-Butyl Alcohol (TBA)	250	280	114	60-140	
Diisopropyl Ether (DIPE)	50	55	110	60-140	
Ethyl-t-Butyl Ether (ETBE)	50	52	105	60-140	
Tert-Amyl-Methyl Ether (TAME)	50	51	102	60-140	
Ethanol	500	570	114	60-140	

Calscience Environmental Laboratories, Inc.

GLOSSARY OF TERMS AND QUALIFIERS

Work Order Number: 02-12-0920

Qualifier	Definition
D	The sample data was reported from a diluted analysis.
J	Analyte was detected at a concentration below the reporting limit. Reported value is estimated.
ND	Not detected at indicated reporting limit.

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 12-13-02

Page 1 of 1

LABORATORY CLIENT: TN + Associates

ADDRESS: 468 E. Main St.

CITY Ventura STATE CA ZIP

TEL: 805-585-2110 FAX: 805-585-2111 E-MAIL: jmarcillac@tnainc.com

CLIENT PROJECT NAME / NUMBER: Penaco SF Site

PROJECT CONTACT: Ewelina Mutkowska

SAMPLER(S): (SIGNATURE)

P.O. NO.: 2002191/84/8402

LAB USE ONLY 12-0926

COOLER RECEIPT TEMP = °C

TURNAROUND TIME
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☒ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ___ / ___ / ___.

SPECIAL INSTRUCTIONS
Standard Data Package only
Waste characterization Sample

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	LOCATION/DESCRIPTION	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or CV	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	CH_4 / TGNMO (25.1)	FIXED GASES (25.1) or (D1946)					
	TANK 241261	11	12-13-02	1430	H2O	4		X			X						X									

Relinquished by: (Signature)

Received by: (Signature)

Date: 12/13/02 Time: 1500

Relinquished by: (Signature)

Received by: (Signature)

Date: Time:

Relinquished by: (Signature)

Received for Laboratory by: (Signature)

Date: 12/13/02 Time: 1700

Calscience
Environmental
Laboratories, Inc.

December 16, 2002

Ewelina Mutkowska
TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Subject: **Calscience Work Order No.:** **02-12-0596**
Client Reference: **PEMACO 2002191 / 84 / 8402**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/10/2002 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Paul Mead
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	Total Digestion
Ventura, CA 93001		Method:	EPA 6010B / EPA 7471A

Project: PEMACO 2002191 / 84 / 8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Soil Bin # 274716	02-12-0596-1	12/10/02	Solid	12/10/02	12/12/02	021210L08

Comment(s): Mercury was analyzed on 12/11/2002 2:54:52 PM with batch 021211L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Antimony	ND	0.750	1		mg/kg	Mercury	ND	0.0835	1		mg/kg
Arsenic	3.03	0.75	1		mg/kg	Molybdenum	ND	0.250	1		mg/kg
Barium	95.5	0.5	1		mg/kg	Nickel	9.24	0.25	1		mg/kg
Beryllium	0.366	0.250	1		mg/kg	Selenium	ND	0.750	1		mg/kg
Cadmium	ND	0.500	1		mg/kg	Silver	ND	0.250	1		mg/kg
Chromium (Total)	15.4	0.2	1		mg/kg	Thallium	ND	0.750	1		mg/kg
Cobalt	8.56	0.25	1		mg/kg	Vanadium	28.9	0.2	1		mg/kg
Copper	15.3	0.5	1		mg/kg	Zinc	57.0	1.0	1		mg/kg
Lead	15.7	0.5	1		mg/kg						

Method Blank	099-04-007-1,777	N/A	Solid	12/11/02	12/11/02	021211L01

Parameter	Result	RL	DF	Qual	Units
Mercury	ND	0.0835	1		mg/kg

Method Blank	097-01-002-3,864	N/A	Solid	12/10/02	12/10/02	021210L08

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Antimony	ND	0.750	1		mg/kg	Molybdenum	ND	0.250	1		mg/kg
Arsenic	ND	0.750	1		mg/kg	Nickel	ND	0.250	1		mg/kg
Barium	ND	0.500	1		mg/kg	Selenium	ND	0.750	1		mg/kg
Beryllium	ND	0.250	1		mg/kg	Silver	ND	0.250	1		mg/kg
Cadmium	ND	0.500	1		mg/kg	Thallium	ND	0.750	1		mg/kg
Chromium (Total)	ND	0.250	1		mg/kg	Vanadium	ND	0.250	1		mg/kg
Cobalt	ND	0.250	1		mg/kg	Zinc	ND	1.00	1		mg/kg
Copper	ND	0.500	1		mg/kg	Lead	ND	0.500	1		mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	Ext. + D/I
Ventura, CA 93001		Method:	TPH - Carbon Range

Project: PEMACO 2002191 / 84 / 8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Soil Bin # 274716	02-12-0596-1	12/10/02	Solid	12/13/02	12/14/02	021213B07

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
C7	ND		1		mg/kg	C19-C20	0.63		1		mg/kg
C8	ND		1		mg/kg	C21-C22	1.3		1		mg/kg
C9-C10	ND		1		mg/kg	C23-C24	1.9		1		mg/kg
C11-C12	ND		1		mg/kg	C25-C28	6.7		1		mg/kg
C13-C14	ND		1		mg/kg	C29-C32	17		1		mg/kg
C15-C16	0.017		1		mg/kg	C33-C36	18		1		mg/kg
C17-C18	0.16		1		mg/kg	C7-C36 Total	45	5	1		mg/kg
Surrogates:	REC (%)	Control Limits		Qual							
Decachlorobiphenyl	70	45-149									

Method Blank	098-03-002-2,272	N/A	Solid	12/13/02	12/13/02	021213B07

Parameter	Result	RL	DF	Qual	Units
TPH as Diesel	ND	5.0	1		mg/kg
Surrogates:	REC (%)	Control Limits		Qual	
Decachlorobiphenyl	118	45-149			

Total = 90 mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	EPA 5030B
Ventura, CA 93001		Method:	EPA 8260B

Project: PEMACO 2002191 / 84 / 8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Soil Bin # 274716	02-12-0596-1	12/10/02	Solid	N/A	12/13/02	021212L03

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Acetone	ND	50	1		ug/kg	1,3-Dichloropropane	ND	5.0	1		ug/kg
Benzene	ND	5.0	1		ug/kg	2,2-Dichloropropane	ND	5.0	1		ug/kg
Bromobenzene	ND	5.0	1		ug/kg	1,1-Dichloropropene	ND	5.0	1		ug/kg
Bromochloromethane	ND	5.0	1		ug/kg	c-1,3-Dichloropropene	ND	5.0	1		ug/kg
Bromodichloromethane	ND	5.0	1		ug/kg	t-1,3-Dichloropropene	ND	5.0	1		ug/kg
Bromoform	ND	5.0	1		ug/kg	Ethylbenzene	ND	5.0	1		ug/kg
Bromomethane	ND	25	1		ug/kg	2-Hexanone	ND	50	1		ug/kg
2-Butanone	ND	50	1		ug/kg	Isopropylbenzene	ND	5.0	1		ug/kg
n-Butylbenzene	ND	5.0	1		ug/kg	p-Isopropyltoluene	ND	5.0	1		ug/kg
sec-Butylbenzene	ND	5.0	1		ug/kg	Methylene Chloride	ND	50	1		ug/kg
tert-Butylbenzene	ND	5.0	1		ug/kg	4-Methyl-2-Pentanone	ND	50	1		ug/kg
Carbon Disulfide	ND	50	1		ug/kg	Naphthalene	ND	50	1		ug/kg
Carbon Tetrachloride	ND	5.0	1		ug/kg	n-Propylbenzene	ND	5.0	1		ug/kg
Chlorobenzene	ND	5.0	1		ug/kg	Styrene	ND	5.0	1		ug/kg
Chloroethane	ND	5.0	1		ug/kg	1,1,1,2-Tetrachloroethane	ND	5.0	1		ug/kg
Chloroform	ND	5.0	1		ug/kg	1,1,2,2-Tetrachloroethane	ND	5.0	1		ug/kg
Chloromethane	ND	25	1		ug/kg	Tetrachloroethene	ND	5.0	1		ug/kg
2-Chlorotoluene	ND	5.0	1		ug/kg	Toluene	ND	5.0	1		ug/kg
4-Chlorotoluene	ND	5.0	1		ug/kg	1,2,3-Trichlorobenzene	ND	10	1		ug/kg
Dibromochloromethane	ND	5.0	1		ug/kg	1,2,4-Trichlorobenzene	ND	5.0	1		ug/kg
1,2-Dibromo-3-Chloropropane	ND	10	1		ug/kg	1,1,1-Trichloroethane	ND	5.0	1		ug/kg
1,2-Dibromoethane	ND	5.0	1		ug/kg	1,1,2-Trichloroethane	ND	5.0	1		ug/kg
Dibromomethane	ND	5.0	1		ug/kg	Trichloroethene	ND	5.0	1		ug/kg
1,2-Dichlorobenzene	ND	5.0	1		ug/kg	Trichlorofluoromethane	ND	50	1		ug/kg
1,3-Dichlorobenzene	ND	5.0	1		ug/kg	1,2,3-Trichloropropane	ND	5.0	1		ug/kg
1,4-Dichlorobenzene	ND	5.0	1		ug/kg	1,2,4-Trimethylbenzene	ND	5.0	1		ug/kg
Dichlorodifluoromethane	ND	5.0	1		ug/kg	1,3,5-Trimethylbenzene	ND	5.0	1		ug/kg
1,1-Dichloroethane	ND	5.0	1		ug/kg	Vinyl Acetate	ND	50	1		ug/kg
1,2-Dichloroethane	ND	5.0	1		ug/kg	Vinyl Chloride	ND	5.0	1		ug/kg
1,1-Dichloroethene	ND	5.0	1		ug/kg	p/m-Xylene	ND	5.0	1		ug/kg
c-1,2-Dichloroethene	ND	5.0	1		ug/kg	o-Xylene	ND	5.0	1		ug/kg
t-1,2-Dichloroethene	ND	5.0	1		ug/kg	Methyl-t-Butyl Ether (MTBE)	ND	5.0	1		ug/kg
1,2-Dichloropropane	ND	5.0	1		ug/kg						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	102	79-127		Toluene-d8	99	84-114	
1,4-Bromofluorobenzene	92	68-116					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Date Received: 12/10/02
Work Order No: 02-12-0596
Preparation: EPA 5030B
Method: EPA 8260B

Project: PEMACO 2002191 / 84 / 8402

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	099-10-005-4,290	N/A	Solid	N/A	12/13/02	021212L03

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Acetone	ND	50	1		ug/kg	1,3-Dichloropropane	ND	5.0	1		ug/kg
Benzene	ND	5.0	1		ug/kg	2,2-Dichloropropane	ND	5.0	1		ug/kg
Bromobenzene	ND	5.0	1		ug/kg	1,1-Dichloropropene	ND	5.0	1		ug/kg
Bromochloromethane	ND	5.0	1		ug/kg	c-1,3-Dichloropropene	ND	5.0	1		ug/kg
Bromodichloromethane	ND	5.0	1		ug/kg	t-1,3-Dichloropropene	ND	5.0	1		ug/kg
Bromoform	ND	5.0	1		ug/kg	Ethylbenzene	ND	5.0	1		ug/kg
Bromomethane	ND	25	1		ug/kg	2-Hexanone	ND	50	1		ug/kg
2-Butanone	ND	50	1		ug/kg	Isopropylbenzene	ND	5.0	1		ug/kg
n-Butylbenzene	ND	5.0	1		ug/kg	p-Isopropyltoluene	ND	5.0	1		ug/kg
sec-Butylbenzene	ND	5.0	1		ug/kg	Methylene Chloride	ND	50	1		ug/kg
tert-Butylbenzene	ND	5.0	1		ug/kg	4-Methyl-2-Pentanone	ND	50	1		ug/kg
Carbon Disulfide	ND	50	1		ug/kg	Naphthalene	ND	50	1		ug/kg
Carbon Tetrachloride	ND	5.0	1		ug/kg	n-Propylbenzene	ND	5.0	1		ug/kg
Chlorobenzene	ND	5.0	1		ug/kg	Styrene	ND	5.0	1		ug/kg
Chloroethane	ND	5.0	1		ug/kg	1,1,1,2-Tetrachloroethane	ND	5.0	1		ug/kg
Chloroform	ND	5.0	1		ug/kg	1,1,2,2-Tetrachloroethane	ND	5.0	1		ug/kg
Chloromethane	ND	25	1		ug/kg	Tetrachloroethene	ND	5.0	1		ug/kg
2-Chlorotoluene	ND	5.0	1		ug/kg	Toluene	ND	5.0	1		ug/kg
4-Chlorotoluene	ND	5.0	1		ug/kg	1,2,3-Trichlorobenzene	ND	10	1		ug/kg
Dibromochloromethane	ND	5.0	1		ug/kg	1,2,4-Trichlorobenzene	ND	5.0	1		ug/kg
1,2-Dibromo-3-Chloropropane	ND	10	1		ug/kg	1,1,1-Trichloroethane	ND	5.0	1		ug/kg
1,2-Dibromoethane	ND	5.0	1		ug/kg	1,1,2-Trichloroethane	ND	5.0	1		ug/kg
Dibromomethane	ND	5.0	1		ug/kg	Trichloroethene	ND	5.0	1		ug/kg
1,2-Dichlorobenzene	ND	5.0	1		ug/kg	Trichlorofluoromethane	ND	50	1		ug/kg
1,3-Dichlorobenzene	ND	5.0	1		ug/kg	1,2,3-Trichloropropane	ND	5.0	1		ug/kg
1,4-Dichlorobenzene	ND	5.0	1		ug/kg	1,2,4-Trimethylbenzene	ND	5.0	1		ug/kg
Dichlorodifluoromethane	ND	5.0	1		ug/kg	1,3,5-Trimethylbenzene	ND	5.0	1		ug/kg
1,1-Dichloroethane	ND	5.0	1		ug/kg	Vinyl Acetate	ND	50	1		ug/kg
1,2-Dichloroethane	ND	5.0	1		ug/kg	Vinyl Chloride	ND	5.0	1		ug/kg
1,1-Dichloroethene	ND	5.0	1		ug/kg	p/m-Xylene	ND	5.0	1		ug/kg
c-1,2-Dichloroethene	ND	5.0	1		ug/kg	o-Xylene	ND	5.0	1		ug/kg
t-1,2-Dichloroethene	ND	5.0	1		ug/kg	Methyl-t-Butyl Ether (MTBE)	ND	5.0	1		ug/kg
1,2-Dichloropropane	ND	5.0	1		ug/kg						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	102	79-127		Toluene-d8	98	84-114	
1,4-Bromofluorobenzene	93	68-116					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	Total Digestion
Ventura, CA 93001		Method:	EPA 6010B
Project:	PEMACO 2002191 / 84 / 8402		

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
02-12-0571-1	Solid	ICP 3300	12/10/02	12/12/02	021210S08

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Antimony	48	44	50-115	8	0-20	3
Arsenic	100	100	75-125	1	0-20	
Barium	104	108	75-125	1	0-20	
Beryllium	97	98	75-125	0	0-20	
Cadmium	97	98	75-125	1	0-20	
Chromium (Total)	69	123	75-125	13	0-20	3
Cobalt	99	100	75-125	1	0-20	
Copper	104	105	75-125	1	0-20	
Lead	94	94	75-125	0	0-20	
Molybdenum	91	96	75-125	4	0-20	
Nickel	96	97	75-125	1	0-20	
Selenium	88	89	75-125	1	0-20	
Silver	102	104	75-125	2	0-20	
Thallium	87	89	75-125	2	0-20	
Vanadium	95	97	75-125	1	0-20	
Zinc	99	106	75-125	4	0-20	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMACO 2002191 / 84 / 8402

Date Received: 12/10/02
Work Order No: 02-12-0596
Preparation: Total Digestion
Method: EPA 6010B

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-002-3,864	Solid	ICP 3300	12/10/02	021210-I-08	021210L08

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Antimony	50.0	50.4	101	80-120	
Arsenic	50.0	54.7	109	80-120	
Barium	50.0	55.3	111	80-120	
Beryllium	50.0	51.9	104	80-120	
Cadmium	50.0	53.2	106	80-120	
Chromium (Total)	50.0	52.7	105	80-120	
Cobalt	50.0	56.1	112	80-120	
Copper	50.0	49.9	100	80-120	
Lead	50.0	53.4	107	80-120	
Molybdenum	50.0	51.6	103	80-120	
Nickel	50.0	54.8	110	80-120	
Selenium	50.0	49.1	98	80-120	
Silver	25.0	25.6	103	80-120	
Thallium	50.0	52.6	105	80-120	
Vanadium	50.0	49.8	100	80-120	
Zinc	50.0	52.9	106	80-120	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	Total Digestion
Ventura, CA 93001		Method:	EPA 7471A
Project:	PEMACO 2002191 / 84 / 8402		

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
02-11-1651-4	Solid	Mercury	12/11/02	12/11/02	021211S01

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Mercury	128	123	76-136	4	0-16	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMACO 2002191 / 84 / 8402

Date Received: 12/10/02
Work Order No: 02-12-0596
Preparation: Total Digestion
Method: EPA 7471A

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
099-04-007-1,777	Solid	Mercury	12/11/02	021211-L01	021211L01

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Mercury	0.835	0.861	103	82-124	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	Ext. + D/I
Ventura, CA 93001		Method:	TPH - Carbon Range
Project:	PEMACO 2002191 / 84 / 8402		

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
02-12-0635-1	Solid	GC 3	12/13/02	12/13/02	021213S07

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
TPH as Diesel	96	103	49-139	7	0-28	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	Ext. + D/I
Ventura, CA 93001		Method:	TPH - Carbon Range
Project:	PEMACO 2002191 / 84 / 8402		

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
098-03-002-2,272	Solid	GC 3	12/13/02	003F0101	021213B07

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
TPH as Diesel	400	420	105	65-124	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/10/02
Engineering & Science		Work Order No:	02-12-0596
468 East Main Street		Preparation:	EPA 5030B
Ventura, CA 93001		Method:	EPA 8260B
Project:	PEMACO 2002191 / 84 / 8402		

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
02-12-0618-1	Solid	GC/MS W	N/A	12/13/02	021212S02

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Benzene	87	88	72-127	2	0-25	
Carbon Tetrachloride	98	97	70-130	1	0-25	
Chlorobenzene	86	87	72-131	1	0-25	
1,2-Dichlorobenzene	84	86	70-130	3	0-25	
1,1-Dichloroethene	93	95	69-127	1	0-25	
Toluene	87	87	75-124	0	0-25	
Trichloroethene	77	78	60-137	1	0-25	
Vinyl Chloride	97	112	70-130	15	0-25	
Methyl-t-Butyl Ether (MTBE)	98	97	80-120	1	0-25	
Ethanol	94	89	60-140	6	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMACO 2002191 / 84 / 8402

Date Received: 12/10/02
Work Order No: 02-12-0596
Preparation: EPA 5030B
Method: EPA 8260B

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-10-005-4,290	Solid	GC/MS W	N/A	12/13/02	021212L03

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Benzene	92	94	72-127	3	0-25	
Carbon Tetrachloride	101	103	70-130	2	0-25	
Chlorobenzene	94	94	72-131	0	0-25	
1,2-Dichlorobenzene	93	95	70-130	2	0-25	
1,1-Dichloroethene	98	102	69-127	3	0-25	
Toluene	92	95	75-124	3	0-25	
Trichloroethene	82	84	60-137	3	0-25	
Vinyl Chloride	112	112	79-118	0	0-25	
Methyl-t-Butyl Ether (MTBE)	100	102	80-120	3	0-25	
Tert-Butyl Alcohol (TBA)	94	100	60-140	6	0-25	
Diisopropyl Ether (DIPE)	101	104	60-140	3	0-25	
Ethyl-t-Butyl Ether (ETBE)	106	110	60-140	3	0-25	
Tert-Amyl-Methyl Ether (TAME)	100	102	60-140	2	0-25	
Ethanol	90	96	60-140	7	0-25	

Calscience Environmental Laboratories, Inc.

GLOSSARY OF TERMS AND QUALIFIERS

Work Order Number: 02-12-0596

Qualifier	Definition
3	Spike or Spike Duplicate compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
ND	Not detected at indicated reporting limit.

7440 Lincoln Way, Garden Grove, CA 92841-1432 • TEL: (714) 895-5494 • FAX: (714) 894-7501

Calscience
Environmental
Laboratories, Inc.

December 16, 2002

Ewelina Mutkowska
TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Subject: **Calscience Work Order No.:** **02-12-0706**
Client Reference: **PEMECO SF Pilot Study**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/11/2002 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Paul Mead
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/11/02
Engineering & Science		Work Order No:	02-12-0706
468 East Main Street		Preparation:	EPA 5030B
Ventura, CA 93001		Method:	EPA 8260B

Project: PEMECO SF Pilot Study

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
RW-01-70 PEMACO	02-12-0706-2	12/11/02	Aqueous	N/A	12/12/02	021212L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Acetone	ND	10	1		ug/L	1,3-Dichloropropane	ND	1.0	1		ug/L
Benzene	1.0	0.5	1		ug/L	2,2-Dichloropropane	ND	1.0	1		ug/L
Bromobenzene	ND	1.0	1		ug/L	1,1-Dichloropropene	ND	1.0	1		ug/L
Bromochloromethane	ND	1.0	1		ug/L	c-1,3-Dichloropropene	ND	0.50	1		ug/L
Bromodichloromethane	ND	1.0	1		ug/L	t-1,3-Dichloropropene	ND	0.50	1		ug/L
Bromoform	ND	1.0	1		ug/L	Ethylbenzene	ND	1.0	1		ug/L
Bromomethane	ND	10	1		ug/L	2-Hexanone	ND	10	1		ug/L
2-Butanone	ND	10	1		ug/L	Isopropylbenzene	ND	1.0	1		ug/L
n-Butylbenzene	ND	1.0	1		ug/L	p-Isopropyltoluene	ND	1.0	1		ug/L
sec-Butylbenzene	ND	1.0	1		ug/L	Methylene Chloride	ND	10	1		ug/L
tert-Butylbenzene	ND	1.0	1		ug/L	4-Methyl-2-Pentanone	ND	10	1		ug/L
Carbon Disulfide	ND	10	1		ug/L	Naphthalene	ND	10	1		ug/L
Carbon Tetrachloride	ND	0.50	1		ug/L	n-Propylbenzene	ND	1.0	1		ug/L
Chlorobenzene	ND	1.0	1		ug/L	Styrene	ND	1.0	1		ug/L
Chloroethane	ND	1.0	1		ug/L	1,1,1,2-Tetrachloroethane	ND	1.0	1		ug/L
Chloroform	1.5	1.0	1		ug/L	1,1,2,2-Tetrachloroethane	ND	1.0	1		ug/L
Chloromethane	ND	10	1		ug/L	Tetrachloroethene	5.2	1.0	1		ug/L
2-Chlorotoluene	ND	1.0	1		ug/L	Toluene	3.3	1.0	1		ug/L
4-Chlorotoluene	ND	1.0	1		ug/L	1,2,3-Trichlorobenzene	ND	1.0	1		ug/L
Dibromochloromethane	ND	1.0	1		ug/L	1,2,4-Trichlorobenzene	ND	1.0	1		ug/L
1,2-Dibromo-3-Chloropropane	ND	5.0	1		ug/L	1,1,1-Trichloroethane	ND	1.0	1		ug/L
1,2-Dibromoethane	ND	1.0	1		ug/L	1,1,2-Trichloroethane	ND	1.0	1		ug/L
Dibromomethane	ND	1.0	1		ug/L	Trichloroethene	15000	200	200	D	ug/L
1,2-Dichlorobenzene	ND	1.0	1		ug/L	Trichlorofluoromethane	ND	10	1		ug/L
1,3-Dichlorobenzene	ND	1.0	1		ug/L	1,2,3-Trichloropropane	ND	5.0	1		ug/L
1,4-Dichlorobenzene	ND	1.0	1		ug/L	1,2,4-Trimethylbenzene	ND	1.0	1		ug/L
Dichlorodifluoromethane	ND	1.0	1		ug/L	1,3,5-Trimethylbenzene	ND	1.0	1		ug/L
1,1-Dichloroethane	1.3	1.0	1		ug/L	Vinyl Acetate	ND	10	1		ug/L
1,2-Dichloroethane	ND	0.50	1		ug/L	Vinyl Chloride	68	0.50	1		ug/L
1,1-Dichloroethene	5.5	1.0	1		ug/L	p/m-Xylene	1.0	1.0	1		ug/L
c-1,2-Dichloroethene	1400	20	20	D	ug/L	o-Xylene	0.43	1.0	1	J	ug/L
t-1,2-Dichloroethene	27	1	1		ug/L	Methyl-t-Butyl Ether (MTBE)	ND	1.0	1		ug/L
1,2-Dichloropropane	ND	1.0	1		ug/L						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	91	86-118		Toluene-d8	99	88-110	
1,4-Bromofluorobenzene	96	86-115					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/11/02
Engineering & Science		Work Order No:	02-12-0706
468 East Main Street		Preparation:	EPA 5030B
Ventura, CA 93001		Method:	EPA 8260B

Project: PEMECO SF Pilot Study

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	099-10-006-6,451	N/A	Aqueous	N/A	12/12/02	021212L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Acetone	ND	10	1		ug/L	1,3-Dichloropropane	ND	1.0	1		ug/L
Benzene	ND	0.50	1		ug/L	2,2-Dichloropropane	ND	1.0	1		ug/L
Bromobenzene	ND	1.0	1		ug/L	1,1-Dichloropropene	ND	1.0	1		ug/L
Bromochloromethane	ND	1.0	1		ug/L	c-1,3-Dichloropropene	ND	0.50	1		ug/L
Bromodichloromethane	ND	1.0	1		ug/L	t-1,3-Dichloropropene	ND	0.50	1		ug/L
Bromoform	ND	1.0	1		ug/L	Ethylbenzene	ND	1.0	1		ug/L
Bromomethane	ND	10	1		ug/L	2-Hexanone	ND	10	1		ug/L
2-Butanone	ND	10	1		ug/L	Isopropylbenzene	ND	1.0	1		ug/L
n-Butylbenzene	ND	1.0	1		ug/L	p-Isopropyltoluene	ND	1.0	1		ug/L
sec-Butylbenzene	ND	1.0	1		ug/L	Methylene Chloride	ND	10	1		ug/L
tert-Butylbenzene	ND	1.0	1		ug/L	4-Methyl-2-Pentanone	ND	10	1		ug/L
Carbon Disulfide	ND	10	1		ug/L	Naphthalene	ND	10	1		ug/L
Carbon Tetrachloride	ND	0.50	1		ug/L	n-Propylbenzene	ND	1.0	1		ug/L
Chlorobenzene	ND	1.0	1		ug/L	Styrene	ND	1.0	1		ug/L
Chloroethane	ND	1.0	1		ug/L	1,1,1,2-Tetrachloroethane	ND	1.0	1		ug/L
Chloroform	ND	1.0	1		ug/L	1,1,2,2-Tetrachloroethane	ND	1.0	1		ug/L
Chloromethane	ND	10	1		ug/L	Tetrachloroethene	ND	1.0	1		ug/L
2-Chlorotoluene	ND	1.0	1		ug/L	Toluene	ND	1.0	1		ug/L
4-Chlorotoluene	ND	1.0	1		ug/L	1,2,3-Trichlorobenzene	ND	1.0	1		ug/L
Dibromochloromethane	ND	1.0	1		ug/L	1,2,4-Trichlorobenzene	ND	1.0	1		ug/L
1,2-Dibromo-3-Chloropropane	ND	5.0	1		ug/L	1,1,1-Trichloroethane	ND	1.0	1		ug/L
1,2-Dibromoethane	ND	1.0	1		ug/L	1,1,2-Trichloroethane	ND	1.0	1		ug/L
Dibromomethane	ND	1.0	1		ug/L	Trichloroethene	ND	1.0	1		ug/L
1,2-Dichlorobenzene	ND	1.0	1		ug/L	Trichlorofluoromethane	ND	10	1		ug/L
1,3-Dichlorobenzene	ND	1.0	1		ug/L	1,2,3-Trichloropropane	ND	5.0	1		ug/L
1,4-Dichlorobenzene	ND	1.0	1		ug/L	1,2,4-Trimethylbenzene	ND	1.0	1		ug/L
Dichlorodifluoromethane	ND	1.0	1		ug/L	1,3,5-Trimethylbenzene	ND	1.0	1		ug/L
1,1-Dichloroethane	ND	1.0	1		ug/L	Vinyl Acetate	ND	10	1		ug/L
1,2-Dichloroethane	ND	0.50	1		ug/L	Vinyl Chloride	ND	0.50	1		ug/L
1,1-Dichloroethene	ND	1.0	1		ug/L	p/m-Xylene	ND	1.0	1		ug/L
c-1,2-Dichloroethene	ND	1.0	1		ug/L	o-Xylene	ND	1.0	1		ug/L
t-1,2-Dichloroethene	ND	1.0	1		ug/L	Methyl-t-Butyl Ether (MTBE)	ND	1.0	1		ug/L
1,2-Dichloropropane	ND	1.0	1		ug/L						
Surrogates:	REC (%)	Control Limits		Qual		Surrogates:	REC (%)	Control Limits		Qual	
Dibromofluoromethane	104	86-118				Toluene-d8	103	88-110			
1,4-Bromofluorobenzene	97	86-115									

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
468 East Main Street
Ventura, CA 93001

Date Sampled: 12/11/02
Date Received: 12/11/02

Work Order No.: 02-12-0706
Method: **EPA 8260B**
Additional Compounds

Project: Pemaco Superfund

Client Sample Number	Lab Sample Number:	Matrix:	Date Collected:	Date Extracted:	Date Analyzed:	QC Batch ID:
RW-01-70 PEMACO	02-12-0706-2	Aqueous	12/11/02	N/A	12/12/02	021212L01

Parameter	Result	RL	DF	Qual	Units
Acrylonitrile	ND	20	1		µg/L
Methyl Acetate	ND	20	1		µg/L
Hexane	60	1.0	1		µg/L
Cyclohexane	262	1.0	1		µg/L
Methylcyclohexane	ND	1.0	1		µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	1		µg/L

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	91	86-118		Toluene-d8	99	88-110	
1,4-Bromofluorobenzene	96	86-115					

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
468 East Main Street
Ventura, CA 93001

Date Sampled: 12/11/02
Date Received: 12/11/02

Work Order No.: 02-12-0706
Method: **EPA 8260B**
Additional Compounds

Project: Pemaco Superfund

Client Sample Number	Lab Sample Number:	Matrix:	Date Collected:	Date Extracted:	Date Analyzed:	QC Batch ID:
N/A	099-10-006-6451	Aqueous	N/A	N/A	12/12/02	021212L01

Parameter	Result	RL	DF	Qual	Units
Acrylonitrile	ND	20	1		µg/L
Methyl Acetate	ND	20	1		µg/L
Hexane	ND	1.0	1		µg/L
Cyclohexane	ND	1.0	1		µg/L
Methylcyclohexane	ND	1.0	1		µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	10	1		µg/L

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
Dibromofluoromethane	104	86-118		Toluene-d8	103	88-110	
1,4-Bromofluorobenzene	97	86-115					

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates		Date Received:	12/11/02
Engineering & Science		Work Order No:	02-12-0706
468 East Main Street		Preparation:	N/A
Ventura, CA 93001		Method:	EPA TO-15

Project: PEMECO SF Pilot Study

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
RW-01-70 PEMACO	02-12-0706-1	12/11/02	Air	N/A	12/12/02	021212L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	250	500		ppb (v/v)	1,1,2-Trichloroethane	ND	250	500		ppb (v/v)
Chloromethane	ND	250	500		ppb (v/v)	Toluene	870	250	500		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	ND	1000	500		ppb (v/v)	2-Hexanone	ND	500	500		ppb (v/v)
Vinyl Chloride	29000	2500	5000	D	ppb (v/v)	4-Methyl-2-Pentanone	ND	500	500		ppb (v/v)
Bromomethane	ND	250	500		ppb (v/v)	Dibromochloromethane	ND	250	500		ppb (v/v)
Chloroethane	ND	250	500		ppb (v/v)	Trichloroethene	190000	10000	20000	D	ppb (v/v)
Trichlorofluoromethane	ND	250	500		ppb (v/v)	1,2-Dibromoethane	ND	250	500		ppb (v/v)
Acetone	ND	500	500		ppb (v/v)	Tetrachloroethene	940	250	500		ppb (v/v)
1,1-Dichloroethene	3400	250	500		ppb (v/v)	Chlorobenzene	ND	250	500		ppb (v/v)
Methylene Chloride	ND	1000	500		ppb (v/v)	Ethylbenzene	ND	250	500		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	500	500		ppb (v/v)	p/m-Xylene	ND	500	500		ppb (v/v)
Carbon Disulfide	960	250	500		ppb (v/v)	Bromoform	ND	250	500		ppb (v/v)
t-1,2-Dichloroethene	4800	250	500		ppb (v/v)	Styrene	ND	500	500		ppb (v/v)
1,1-Dichloroethane	ND	250	500		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	250	500		ppb (v/v)
Vinyl Acetate	ND	500	500		ppb (v/v)	o-Xylene	ND	250	500		ppb (v/v)
2-Butanone	ND	500	500		ppb (v/v)	4-Ethyltoluene	ND	250	500		ppb (v/v)
c-1,2-Dichloroethene	83000	2500	5000	D	ppb (v/v)	1,3,5-Trimethylbenzene	ND	250	500		ppb (v/v)
Chloroform	ND	250	500		ppb (v/v)	1,2,4-Trimethylbenzene	ND	500	500		ppb (v/v)
1,2-Dichloroethane	ND	250	500		ppb (v/v)	Benzyl Chloride	ND	500	500		ppb (v/v)
1,1,1-Trichloroethane	ND	250	500		ppb (v/v)	1,3-Dichlorobenzene	ND	250	500		ppb (v/v)
Benzene	ND	250	500		ppb (v/v)	1,4-Dichlorobenzene	ND	250	500		ppb (v/v)
Carbon Tetrachloride	ND	250	500		ppb (v/v)	1,2-Dichlorobenzene	ND	250	500		ppb (v/v)
1,2-Dichloropropane	ND	250	500		ppb (v/v)	1,2,4-Trichlorobenzene	ND	500	500		ppb (v/v)
Bromodichloromethane	ND	250	500		ppb (v/v)	Hexachloro-1,3-Butadiene	290	250	500		ppb (v/v)
c-1,3-Dichloropropene	ND	250	500		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	1000	500		ppb (v/v)
t-1,3-Dichloropropene	ND	500	500		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

ANALYTICAL REPORT

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001

Date Received: 12/11/02
Work Order No: 02-12-0706
Preparation: N/A
Method: EPA TO-15

Project: PEMECO SF Pilot Study

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	095-01-021-1,846	N/A	Air	N/A	12/12/02	021212L01

Parameter	Result	RL	DF	Qual	Units	Parameter	Result	RL	DF	Qual	Units
Dichlorodifluoromethane	ND	0.50	1		ppb (v/v)	1,1,2-Trichloroethane	ND	0.50	1		ppb (v/v)
Chloromethane	ND	0.50	1		ppb (v/v)	Toluene	ND	0.50	1		ppb (v/v)
1,2-Dichloro-1,1,2,2-Tetrafluoroethane	ND	2.0	1		ppb (v/v)	2-Hexanone	ND	1.0	1		ppb (v/v)
Vinyl Chloride	ND	0.50	1		ppb (v/v)	4-Methyl-2-Pentanone	ND	1.0	1		ppb (v/v)
Bromomethane	ND	0.50	1		ppb (v/v)	Dibromochloromethane	ND	0.50	1		ppb (v/v)
Chloroethane	ND	0.50	1		ppb (v/v)	Trichloroethene	ND	0.50	1		ppb (v/v)
Trichlorofluoromethane	ND	0.50	1		ppb (v/v)	1,2-Dibromoethane	ND	0.50	1		ppb (v/v)
Acetone	ND	1.0	1		ppb (v/v)	Tetrachloroethene	ND	0.50	1		ppb (v/v)
1,1-Dichloroethene	ND	0.50	1		ppb (v/v)	Chlorobenzene	ND	0.50	1		ppb (v/v)
Methylene Chloride	ND	2.0	1		ppb (v/v)	Ethylbenzene	ND	0.50	1		ppb (v/v)
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	1.0	1		ppb (v/v)	p/m-Xylene	ND	1.0	1		ppb (v/v)
Carbon Disulfide	ND	0.50	1		ppb (v/v)	Bromoform	ND	0.50	1		ppb (v/v)
t-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	Styrene	ND	1.0	1		ppb (v/v)
1,1-Dichloroethane	ND	0.50	1		ppb (v/v)	1,1,2,2-Tetrachloroethane	ND	0.50	1		ppb (v/v)
Vinyl Acetate	ND	1.0	1		ppb (v/v)	o-Xylene	ND	0.50	1		ppb (v/v)
2-Butanone	ND	1.0	1		ppb (v/v)	4-Ethyltoluene	ND	0.50	1		ppb (v/v)
c-1,2-Dichloroethene	ND	0.50	1		ppb (v/v)	1,3,5-Trimethylbenzene	ND	0.50	1		ppb (v/v)
Chloroform	ND	0.50	1		ppb (v/v)	1,2,4-Trimethylbenzene	ND	1.0	1		ppb (v/v)
1,2-Dichloroethane	ND	0.50	1		ppb (v/v)	Benzyl Chloride	ND	1.0	1		ppb (v/v)
1,1,1-Trichloroethane	ND	0.50	1		ppb (v/v)	1,3-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Benzene	ND	0.50	1		ppb (v/v)	1,4-Dichlorobenzene	ND	0.50	1		ppb (v/v)
Carbon Tetrachloride	ND	0.50	1		ppb (v/v)	1,2-Dichlorobenzene	ND	0.50	1		ppb (v/v)
1,2-Dichloropropane	ND	0.50	1		ppb (v/v)	1,2,4-Trichlorobenzene	ND	1.0	1		ppb (v/v)
Bromodichloromethane	ND	0.50	1		ppb (v/v)	Hexachloro-1,3-Butadiene	ND	0.50	1		ppb (v/v)
c-1,3-Dichloropropene	ND	0.50	1		ppb (v/v)	Methyl-t-Butyl Ether (MTBE)	ND	2.0	1		ppb (v/v)
t-1,3-Dichloropropene	ND	1.0	1		ppb (v/v)						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

TN & Associates		Date Received:	12/11/02
Engineering & Science		Work Order No:	02-12-0706
468 East Main Street		Preparation:	EPA 5030B
Ventura, CA 93001		Method:	EPA 8260B
Project: PEMECO SF Pilot Study			

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
02-12-0616-1	Aqueous	GC/MS T	N/A	12/12/02	021212S01

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Benzene	93	100	72-127	7	0-25	
Carbon Tetrachloride	100	106	70-130	6	0-25	
Chlorobenzene	93	99	72-131	7	0-25	
1,2-Dichlorobenzene	93	99	70-130	7	0-25	
1,1-Dichloroethene	94	98	69-127	4	0-25	
Toluene	94	100	75-124	6	0-25	
Trichloroethene	93	101	60-137	8	0-25	
Vinyl Chloride	89	97	70-130	8	0-25	
Methyl-t-Butyl Ether (MTBE)	86	95	80-120	10	0-25	
Ethanol	104	112	60-140	7	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMECO SF Pilot Study

Date Received: 12/11/02
Work Order No: 02-12-0706
Preparation: EPA 5030B
Method: EPA 8260B

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-10-006-6,451	Aqueous	GC/MS T	N/A	12/12/02	021212L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Benzene	104	103	72-127	0	0-25	
Carbon Tetrachloride	112	112	70-130	0	0-25	
Chlorobenzene	102	102	72-131	0	0-25	
1,2-Dichlorobenzene	101	102	70-130	1	0-25	
1,1-Dichloroethene	105	106	69-127	0	0-25	
Toluene	105	104	75-124	1	0-25	
Trichloroethene	91	90	60-137	1	0-25	
Vinyl Chloride	101	99	79-118	2	0-25	
Methyl-t-Butyl Ether (MTBE)	96	96	80-120	0	0-25	
Tert-Butyl Alcohol (TBA)	110	112	60-140	1	0-25	
Diisopropyl Ether (DIPE)	105	106	60-140	1	0-25	
Ethyl-t-Butyl Ether (ETBE)	101	102	60-140	1	0-25	
Tert-Amyl-Methyl Ether (TAME)	103	103	60-140	0	0-25	
Ethanol	110	106	60-140	4	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

TN & Associates
Engineering & Science
468 East Main Street
Ventura, CA 93001
Project: PEMECO SF Pilot Study

Date Received: 12/11/02
Work Order No: 02-12-0706
Preparation: N/A
Method: EPA TO-15

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-021-1,846	Air	GC/MS K	N/A	12/12/02	021212L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Vinyl Chloride	99	99	60-140	0	0-30	
1,2-Dichloroethane	113	112	60-140	1	0-30	
Benzene	118	115	60-140	3	0-30	
Carbon Tetrachloride	112	110	60-140	2	0-30	
1,2-Dichloropropane	115	111	60-140	3	0-30	
c-1,3-Dichloropropene	124	122	60-140	1	0-30	
1,1,2-Trichloroethane	115	115	60-140	0	0-30	
Toluene	115	113	60-140	2	0-30	
Trichloroethene	118	116	60-140	2	0-30	
1,2-Dibromoethane	119	117	60-140	1	0-30	
Tetrachloroethene	115	112	60-140	3	0-30	
Ethylbenzene	117	114	60-140	2	0-30	
p/m-Xylene	113	112	60-140	1	0-30	
Bromoform	123	122	60-140	1	0-30	
o-Xylene	116	115	60-140	1	0-30	
1,4-Dichlorobenzene	93	109	60-140	16	0-30	
1,2-Dichlorobenzene	99	109	60-140	10	0-30	

Calscience Environmental Laboratories, Inc.

GLOSSARY OF TERMS AND QUALIFIERS

Work Order Number: 02-12-0706

Qualifier	Definition
D	The sample data was reported from a diluted analysis.
J	Analyte was detected at a concentration below the reporting limit. Reported value is estimated.
ND	Not detected at indicated reporting limit.

CAL[illegible]ENCE ENVIRONMENTAL
LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTO[illegible] RECORD

Date 12/11/02

Page 1 of 1

LABORATORY CLIENT: TN & ASSOCIATES, INC.
ADDRESS: 468 E. MAIN ST.
CITY: VENTURA STATE: CA ZIP: 93001
TEL: 805 585 6391 FAX: 805 585-2111 E-MAIL: emutkowska@trainc.com

CLIENT PROJECT NAME / NUMBER: PEMACO SF PILOT STUDY 2002191
PROJECT CONTACT: TIM GARVEY
SAMPLER(S): (SIGNATURE) TDR

P.O. NO.:
LAB USE ONLY 12-0706
COOLER RECEIPT TEMP = °C

TURNAROUND TIME
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ___ / ___ / ___.

SPECIAL INSTRUCTIONS
Analyze w/in 24 hrs.
Questions / Results to Ewelina Mutkowska
805 585 6391 emutkowska@trainc.com

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	LOCATION/DESCRIPTION	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or ___	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	CH_4 / TGNMO (25.1)	FIXED GASES (25.1) or (D1946)				
1	RW-01-70	PEMACO	12/11/02	1645	AIR	1													X						
2	"	"	"	1655	H_2O	2					X														
	* (2) H_2O	8260 B Samples are HOT ~10,000 ppb																							

Relinquished by: (Signature) TDR	Received by: (Signature) Bill Lucas	Date: 12/11/02	Time: 1775
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature) Bill Lucas	Received for Laboratory by: (Signature)	Date: 12/11/02	Time: 1815

10/01/00 Revision

Q&Q Graphic (714) 898-9702